Mining CONGRESS JOURNAL

AMC

NOVEMBER 1951

862 ft. in ONE LIFT!

World's highest-lift single belt conveyor —engineered by LINK-BELT

When the H. C. Frick Coke Co. planned the mining industry's *widest* (72 in.) belt conveyor for their Robena Mine, Link-Belt designed and built it.

When the *longest* (10,900 ft.) belt conveyor was contemplated at National Mines, Link-Belt engineered and built it.

And, when Chicago, Wilmington & Franklin Coal Co. wanted the *highest-lift* belt conveyor ever built, they capitalized on this broad, diversified experience.

Today, at Orient Mine No. 3 near Waltonville, Ill., this Link-Belt 42 in. Belt Conveyor raises 1200 tons of coal per hour 862 ft. to the surface. There are no intermediate transfers . . . no intermittent hoisting by skip or cage. Just continuous, trouble-free, low cost movement on Link-Belt Roller Bearing Idlers.

In other phases of coal preparation, too, Link-Belt is out in front. For washing, drying, sizing, and car handling many of the nation's leading coal mines have found it pays to rely on Link-Belt. We think you'll find it pays, too.

12,578

At the bottom of the mine, Link-Belt 72 in. Apron Feeder and Live-Roll Grizzly provide uniform, high-capacity feed.

Terminal machinery of the 3400 ft. long conveyor includes a 1500 hp L-B double-reduction Herringbone Gear Drive and rubber-lagged welded steel pulley.

LINK-BELT

COAL PREPARATION and HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington 9, W. Va., Louisville 2, Denver 2, Kansas City 8, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Salt Lake City 1, Seattle 4, Toronto 8, Springs (South Africa).

The S-D "Automatic" System Cuts Production Costs 3 Ways . . . in Mining, Coal Haulage and Preparation Plant Operation

A continuous flow of coal from the face to the preparation plant is absolutely essential to low cost mining. The only dependable way this can be accomplished is through the use of an adequate surge bin which will serve as a temporary storage for coal in transit. The only practical method of filling a surge bin is with Automatic Drop Bottom Cars. This Surge Bin used with S-D "Automatic" Cars permits your mining operations and preparation plant to function independently of each other. For each to operate at the lowest possible cost, they must be carried on independently:

1. Any cleaning plant works best, and at the least cost, with an even continuous supply of coal. The Surge Bin continues to supply coal to the preparation plant when, for any cause, there is a delay at the face.

2. With an adequate surge bin, one shift operation of cleaning plant is often sufficient to take care of two shift operation of mine. Breakdowns or delays at the preparation plant need not stop mine production because the surge bin will take the coal until repairs are made.

3. S-D "Automatics" are the most economical means of coal haulage. Usually about 40% fewer cars are needed because of constant, on-the-move dumping. This lowers the initial installation cost and, of course, maintenance cost. These cars are sealed against dust leakage, reducing track clean-up costs to the minimum. Their bottom doors discharge coal in 1-2-3 order enabling S-D "Automatics" to fill a bin level full. S-D "Automatics" eliminate all manual dumping. This one item is enabling many operators to save thousands of dollars every year! The flexibility of S-D "Automatics" offers additional advantages such as: cars are not limited in size . . . top extensions may be added . . . cars with overlapping ends can be used.

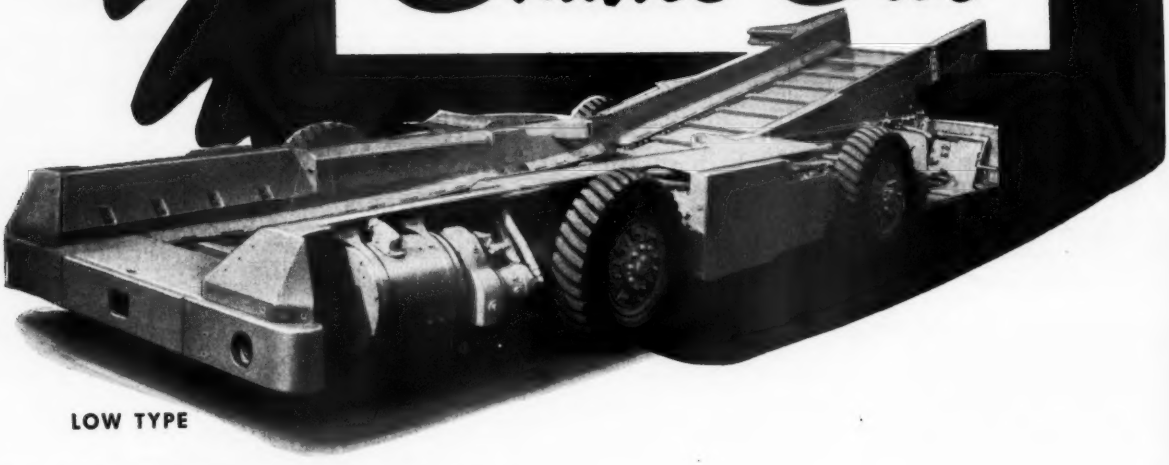
Investigate the S-D "Automatic" System now! It may pay you in thousands of dollars annually. Write us today!

SANFORD-DAY IRON WORKS

KNOXVILLE TENNESSEE

Devoting Our Entire Capacity to the Building of Better Mine Cars for Over— 50 YEARS

A new JEFFREY CLASS 66 Shuttle Car



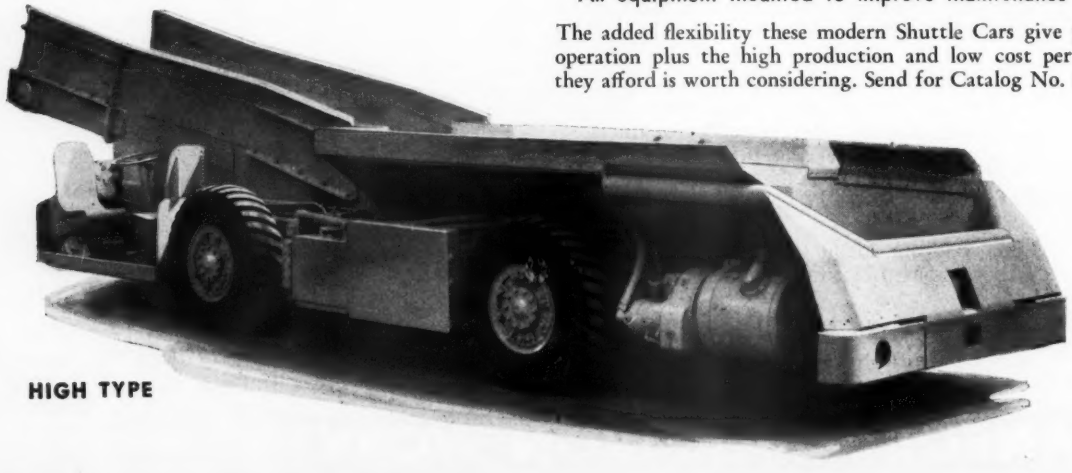
LOW TYPE

Pooling brains and ingenuity with long experience in designing, developing and building a wide range of mining equipment, Jeffrey offers one of its latest units . . . the Class 66 Shuttle Car.

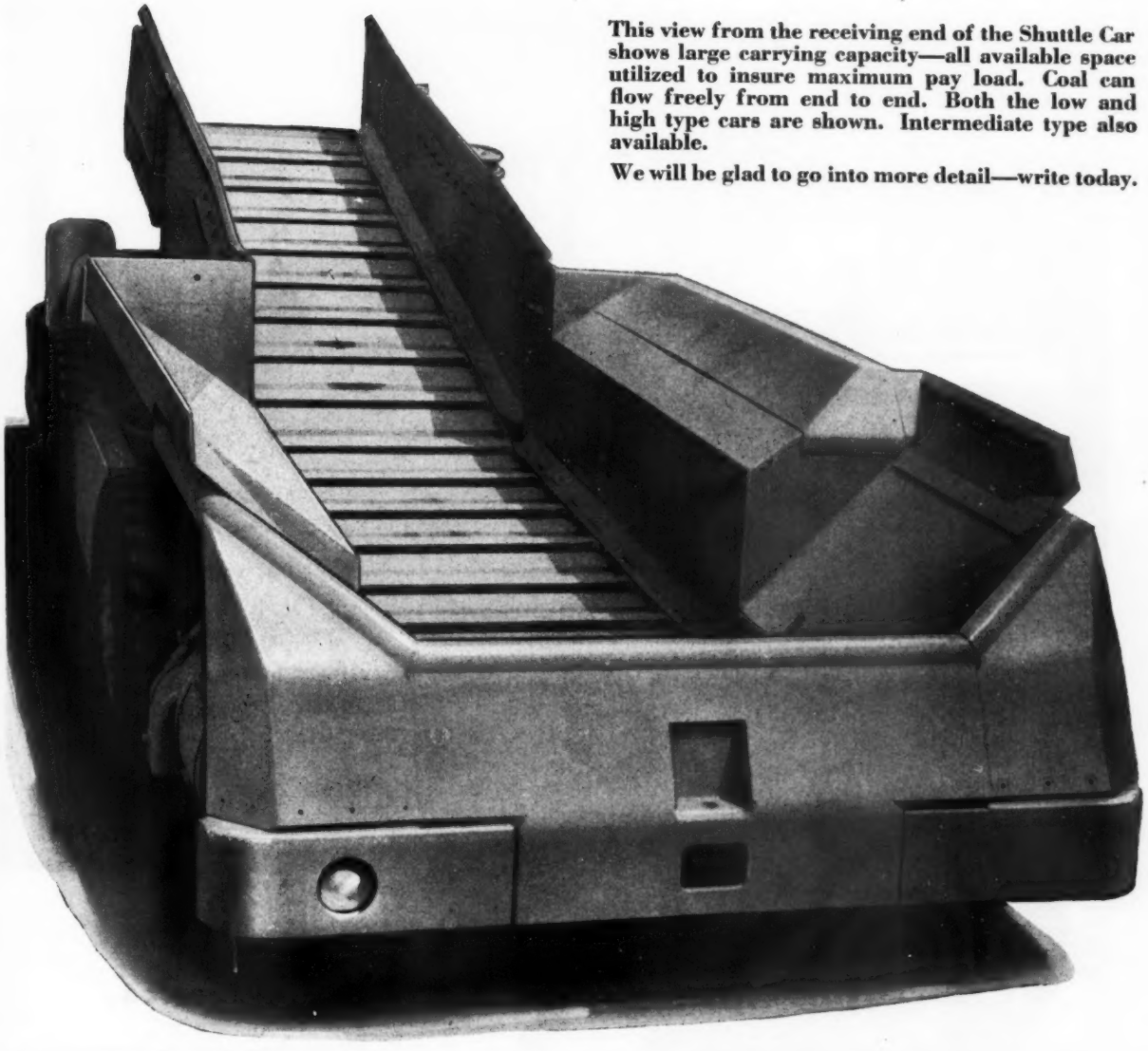
This model features an elevating front section permitting coal to be discharged directly into mine cars or lowered for discharge into main haulage conveyors. Other points include:

NEW Chassis type body design—rigid construction
Airplane Disc-type 4-wheel Hydraulic Brakes
Hydraulically-driven Variable-speed Conveyor
Hydraulically-driven Cable Reel
Improved Hydraulic Booster Steering
All equipment mounted to improve maintenance

The added flexibility these modern Shuttle Cars give your operation plus the high production and low cost per ton they afford is worth considering. Send for Catalog No. 840.



HIGH TYPE



This view from the receiving end of the Shuttle Car shows large carrying capacity—all available space utilized to insure maximum pay load. Coal can flow freely from end to end. Both the low and high type cars are shown. Intermediate type also available.

We will be glad to go into more detail—write today.

THE JEFFREY MANUFACTURING CO.

958 N. Fourth St. **Columbus 16, Ohio**

DISTRICT SALES OFFICES

BALTIMORE 2, MD., Munsey Bldg.
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DENVER 2, 1726 Champa St.
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BRITISH JEFFREY-DIAMOND, LTD., Wakefield, England
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GALION (GREAT BRITAIN) LTD., Wakefield, England

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Bin Valves
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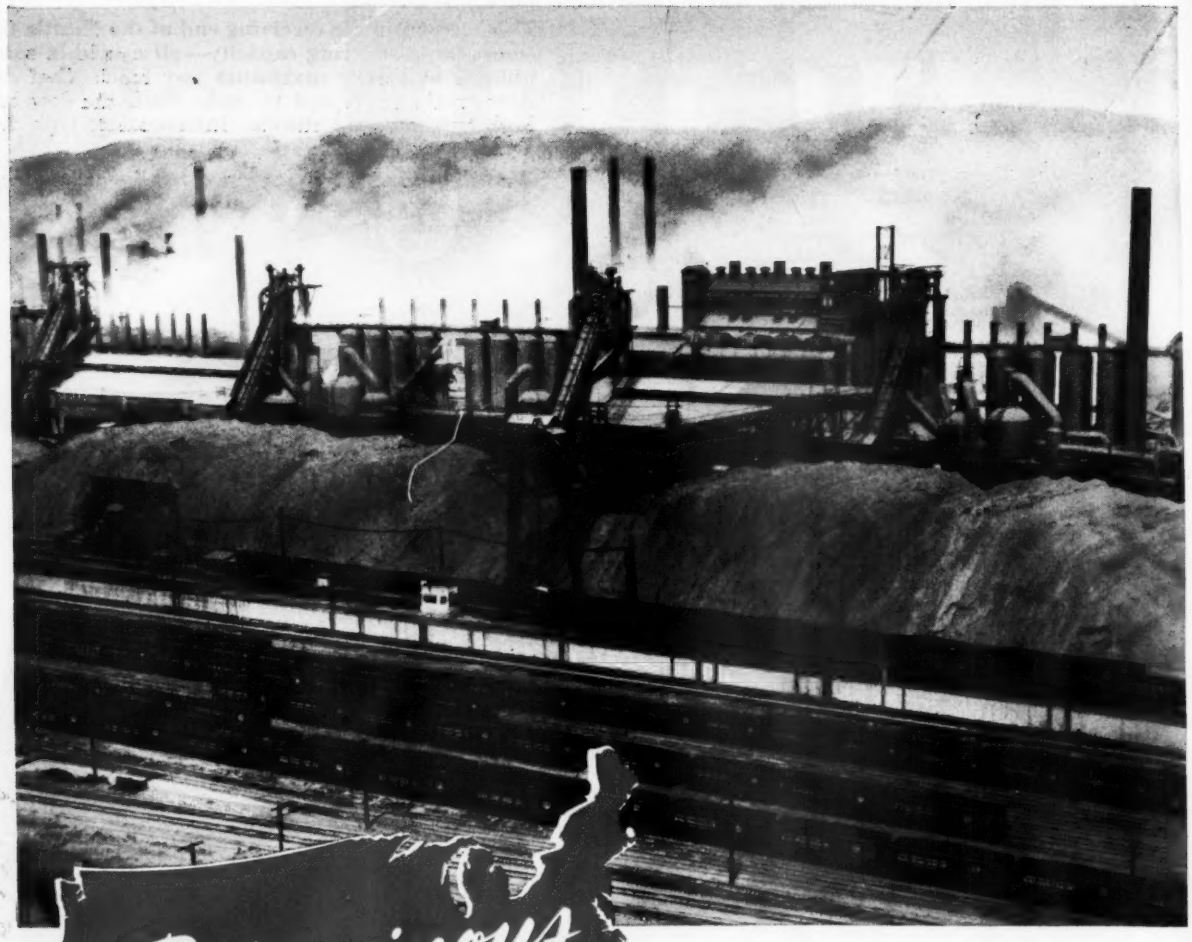
Drills
Feeders
Fans & Blowers
Idlers (Belt)
Jigs
Loaders
Locomotives
Magnetic Separators
Pulverizers
Screens
Shuttle Cars
Transmission Mach'ry



Bituminous

is indispensable to the power of America

The bituminous coal industry
has the strength—the know-how—
to meet *any* challenge.

Only with indispensable bituminous
can the greatness of America be maintained.

For excellent bituminous coals
to meet your every need,
Ask our man!

BALTIMORE & OHIO RAILROAD

Constantly *doing things*—**better!**

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Contents

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THE AMERICAN MINING CONGRESS
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Member Audit Bureau of Circulation.

"Let the shovel go . . . but hang on to that DIPPER"

When the preference for an Amsco Dipper is so strong that a superintendent at one of Minnesota's largest iron mines quietly removes it from a shovel being shipped to another mine, there are apt to be some good performance reasons why!

The superintendent reported that this AMSCO 6½ yard renewable lip dipper *loaded a record number of tons per 8 hour shift*—more than had ever been loaded before. And, where other dippers needed repairs every 2 months or so, it is still going strong after 6 months of service with no repairs of any kind!

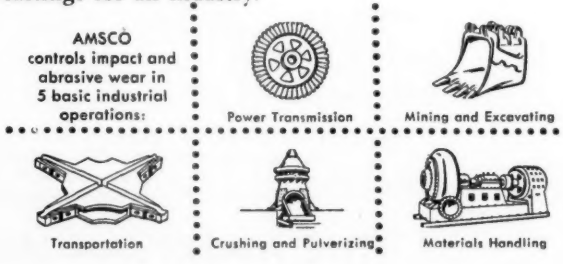
Better design and construction are the reasons for this high production and longer, uninterrupted service. The wide mouth and shallow depth permit faster, easier digging and loading, and a 4-way taper insures clean dumping every time.

And, this dipper is *all-cast*—of tough, work-hardening AMSCO Manganese Steel. The renewable lip and heel plate, when finally worn, are replaceable in a matter of minutes.

Dippers can—and should be—bought with an eye to higher digging efficiency and lower costs per ton . . . and the moral of this actual on-the-job example is clear . . .

WHEREVER YOU MEET A PROBLEM OF WEAR CAUSED BY IMPACT AND/OR ABRASION . . .

. . . find out about longer-lasting, dollar-saving Manganese Steel Dippers made by AMSCO . . . world's largest producer of manganese steel castings for all industry.



Brake Shoe **AMERICAN MANGANESE STEEL DIVISION**

422 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.
Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

THESE MEN* HAVE THE ANSWERS

that cut coal cutting costs

RANDAL LEACH began his career with the electrical crews at South East Coal while in high school. After two years at Lees Jr. College at Jackson, Kentucky and two at mechanical and electrical engineering at University of Kentucky, he returned to that firm; joined the Bowdil organization in 1937. Covers the Middle West, lives at 1004 East St. Louis St. in West Frankfort, Ill. Telephone 675.

V. L. WALKINGTON's advancement of chain lacing ideas have overcome many Western conditions. In 1938, when Vic joined Bowdil, he brought a fine record of 25 years electrical welding, drafting and laying-out experience. Lives at Helper, Utah, covers Utah and part of Western Colorado.

E. D. CAUDILL was schooled in mining and electrical courses in Kentucky, is certified for Mine Foreman in Kentucky and West Virginia. Ed came with Bowdil in March 1937, covers Southern West Virginia. Address Box 132, Danville, West Virginia, you reach him by telephone 336 W. Madison, West Virginia.

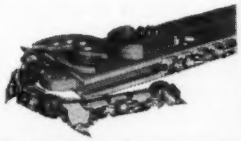
JOS. M. BLASCO brought a lifetime of mining knowledge to Bowdil when he became a representative in May 1933. A graduate of L. C. Cook Engineering School, Chicago, Joe almost completed the I. C. S. course in Engineering, too. He covers Pennsylvania entirely, calls Charleroi, Pa. home, where his residence is at 435 McKean Avenue, and the phone Charleroi 34628.

WILLIAM D. RADCLIFFE went west from Kentucky, stopped to learn his trade at Chicago School of Electrical Engineering . . . then on to Sheridan, Wyoming in 1901 as Chief Electrician for the Carnie Coal Company where he installed the first elecrical mining machine in the area. Another first was the electrical machine at Roundup, Montana for the Milwaukee R. R.'s Republic Coal Co. Joined Bowdil in 1932; covers the Rocky Mountain Area including Colorado, New Mexico, Montana, North Dakota and Wyoming. Customers in the West enjoy the Radcliffe's hospitality at 761 Steele St., Denver, Colorado. Telephone EA-7151.

C. W. (PETE) WEISBURN earned his first State of Ohio Mine Foreman papers after three years in Mine Engineering at Ohio State University. A veteran of all types of mine operation, Pete joined Bowdil in 1945, covers Ohio and into West Virginia direct from the Canton factory—not far from his home in Magnolia, Ohio. Telephone Magnolia 2166.

A. J. LEACH began his mining days with a pick, then operated the first Breast Machines to come to the Tom Corwin Coal Company at Wellston, Ohio, and Superior Coal at Jackson, Ohio in 1900. Has operated machines in all types of seams in Ohio, Kentucky and West Virginia with a rich background of experience from 3 years as Mine Foreman and 15 as Superintendent of South East Coal Company at Seco, Kentucky. Joining Bowdil in July 1933, Leach covers Eastern Kentucky, lives on Sand Lick Road in Whitesburg. Telephone 2232.

BOWDIL CUTTER BAR

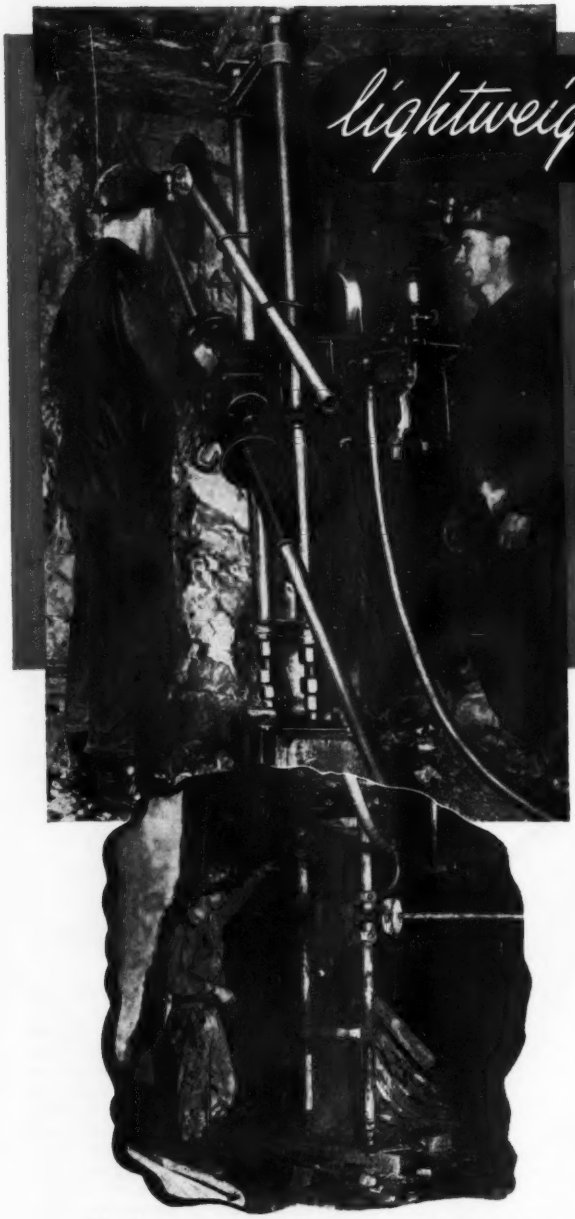


Bowdil Cutter Bars are designed for extra strength and power saving. Rivet-free body, Z bar construction, wide wearing strips make it the sturdiest bar in mining. Bowdil Bars are standardized to fit all coal mining machines.

FABRI-FORGED CHAIN

Lower your operating costs with Bowdil Fabri-Forged Chain. Rugged, easy to maintain, the drop-forged lug body stands up under heavy wear with breakage practically eliminated. A major improvement is the true-running radial track guide.

The BOWDIL COMPANY CANTON, OHIO



lightweight and POWERFUL

...the Longyear

WOLVERINE

DIAMOND CORE DRILL

CUTS UNDERGROUND DRILLING COSTS

The Longyear WOLVERINE is available with air or electric motor; screw feed or hydraulic head. It is furnished with drum hoist. Bit speeds up to 2500 R.P.M. Weight: (with air motor and screw feed) only 500 lbs. Capacity: 800 ft. of 1½ inch hole.

The Longyear WOLVERINE cuts underground drilling costs 3 WAYS

MOVING TIME IS REDUCED. This lightweight drill can be set up quickly. It can be knocked down for easier handling through narrow openings. The compact design of the WOLVERINE makes smaller drilling stations possible.

DRILLING TIME IS REDUCED because the powerful motor with 3 speed transmission provides either high speed for good drilling conditions or extra torque for long holes or tough going.

OPERATING COSTS ARE REDUCED. Balanced design reduces vibration and chatter . . . drill bits last longer. The best materials and workmanship in the WOLVERINE mean lower maintenance costs and longer drill life.

● INVESTIGATE THE 3 WAYS a Longyear WOLVERINE Diamond Core Drill will cut your underground drilling costs.

Write TODAY for revised Bulletin No. 71.

Other Longyear underground Diamond Core Drills are available with capacities from 300 ft. to 2000 ft. of 1½ inch hole.

E. J. LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U. S. A. NEW YORK OFFICE, 1775 BROADWAY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES.

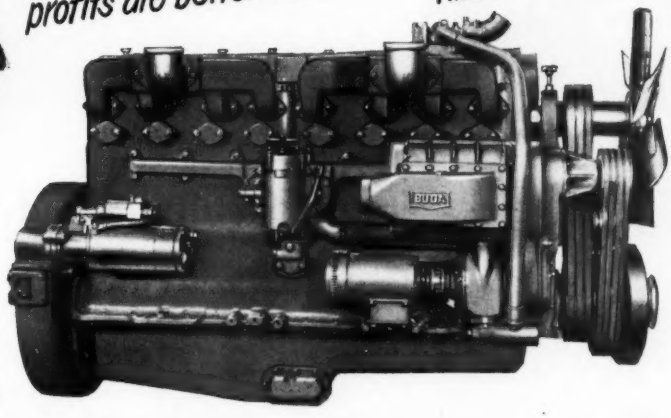
why are BUDA DIESELS your best buy in power?

CONTRACTOR:

"Buda Diesels get my jobs done faster. I don't worry about penalty clauses any-more... profits are better too!"

MAINTENANCE SUPERINTENDENT:

"I like their simple design..they're easier to maintain. They don't jerk our equipment to pieces- engines, clutches, transmissions final drives and tires last longer."



OPERATOR:

"More Torque means less shifting- easier handling More trips per day"

JOB SUPERINTENDENT:

"Buda Diesels keep going. Down-time is at a minimum. Buda powered units really move dirt"

POWER FOR PROFIT WITH BIG BUDA DIESELS

Look at it from any angle—big displacement Buda Diesels give you more power and more profit for your money. Buda Diesels' 13 to 25% greater piston displacement . . . 9 to 23% more torque and lugging ability give your payoff equipment the power to move more yardage at lower cost.

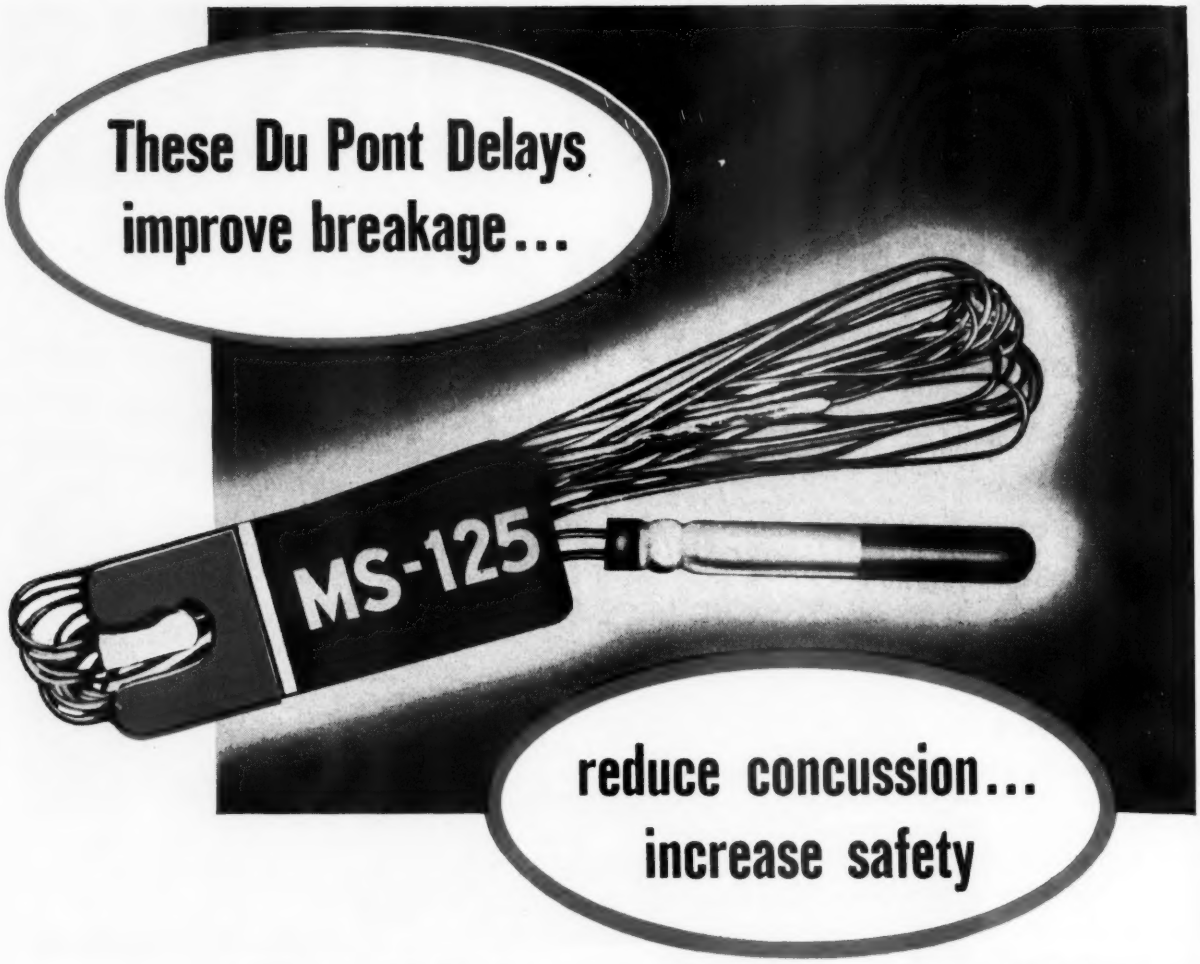
Your Buda Distributor can prove the money-making advantages of Buda dyna-swirl Diesels. Ask him today. Write for Bulletins and data. *The Buda Company, Harvey, Illinois.*

BC-17

a Power-Full and Dependable Name in Engines...

BUDA

Manufacturers of Diesel and Gasoline Engines, Maintenance of Way Products, Lifting Jacks, Earth Drills and Material Handling Equipment



Du Pont "MS" Delay Electric Blasting Caps met with instant approval when they were introduced. Mine operators quickly recognized that "MS" Delays did a better job in many types of blasting than either the conventional long-interval delays or caps and fuse.

Better Fragmentation resulting from the use of "MS" (Millisecond*) Delays is a BIG advantage. It increases production . . . cuts down both blockholing and chute blasting. Breakage is improved even in badly shattered formations.

Reduced Concussion is another big advantage of "MS" Delays. It means less damage to pillar walls.

Greater Safety is always of topmost importance, and the short intervals of "MS" Delay Caps practically eliminate dynamite from the muck. In common with all Du Pont electric blasting devices, these delays are made with waterproof rubber-plug closures, aluminum foil shielded shunts and plastic insulated wires.

Ask the Du Pont Explosives representative in your area for complete information about "MS" (Millisecond) Delay Electric Blasting Caps. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

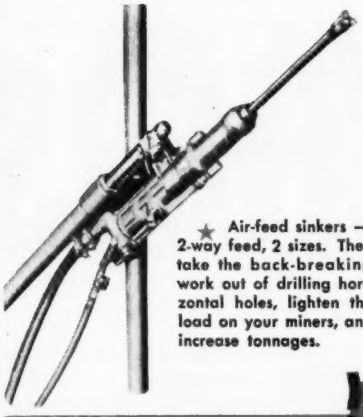
**Available intervals of delay: .025, .050, .075, .100, .125, .150, .175, .200, .250, .300, .350, .400, .450 and .500 seconds.*

DU PONT
REG. U.S. PAT. OFF.

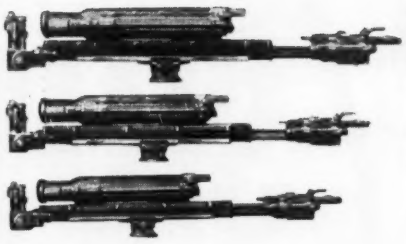
DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

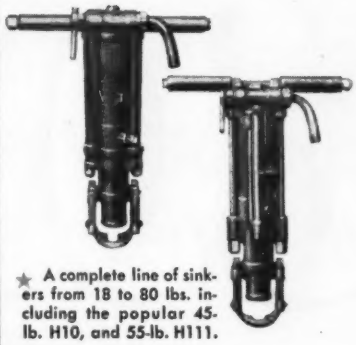
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*



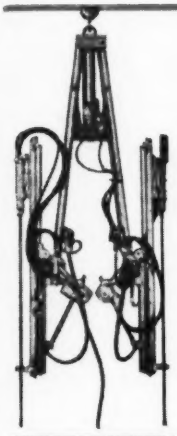
★ Air-feed sinkers — 2-way feed, 2 sizes. They take the back-breaking work out of drilling horizontal holes, lighten the load on your miners, and increase tonnages.



★ Power-feed and hand-cranked drifters. Dependable, powerful, and fast. Ideal for columns and jumbos alike.



★ A complete line of sinkers from 18 to 80 lbs. including the popular 45-lb. H10, and 55-lb. H111.



★ The SDR 34 shaft sinker for faster shaft sinking. Fully closed it's 5'6" between drill centers; open 19'3". All adjustments quickly made with air motor.

It's Le Roi-CLEVELAND for *Rock Drills You Can Count On*

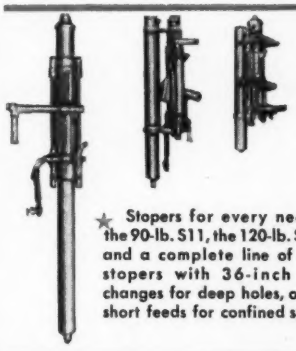
. . . . . fast-drilling, dependable favorites of mining men since 1906

Of course, you know that Le Roi-CLEVELAND builds the popular, easy-holding H10 and H111 sinkers... the fast-drilling PD24, 25, and 14 power feed drifters . . . the S11 and SS22 stopers with trip rotation for easier handling . . . and a mine jumbo that lets you drill out your rounds faster, with greater safety.

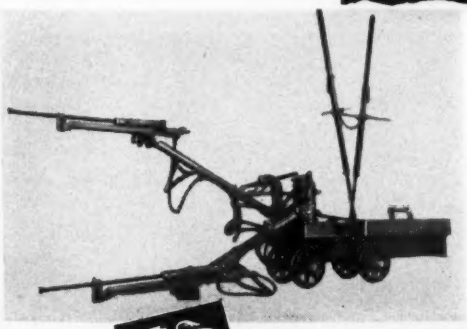
But did you know that Le Roi-CLEVELAND was responsible for some famous "firsts"? Here are a few of them—work-savers that help your miners increase their man-shift production: the air-feed sinker, the offset stoper, the shaft sinker, the stoper jumbo.

So if you have a job of drilling to do—do it with Le Roi-CLEVELAND machines. You can count on them. They're built for speed. And they're built to stay underground, too — where you can use this speed to do more work and cut your costs.

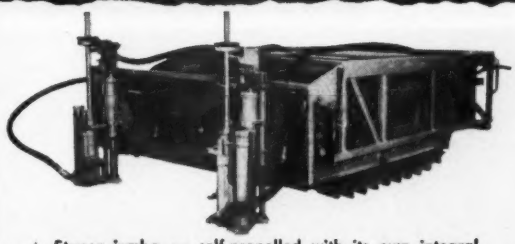
Detailed information about the complete Le Roi-CLEVELAND rock drill line is yours for the asking. Just write us.



★ Stopers for every need — the 90-lb. S11, the 120-lb. SS-22, and a complete line of offset stopers with 36-inch steel changes for deep holes, or with short feeds for confined spaces.



★ The famous MDR Jumbo with air-motor poweredbooms for quicker set-ups, greater safety, faster rounds.



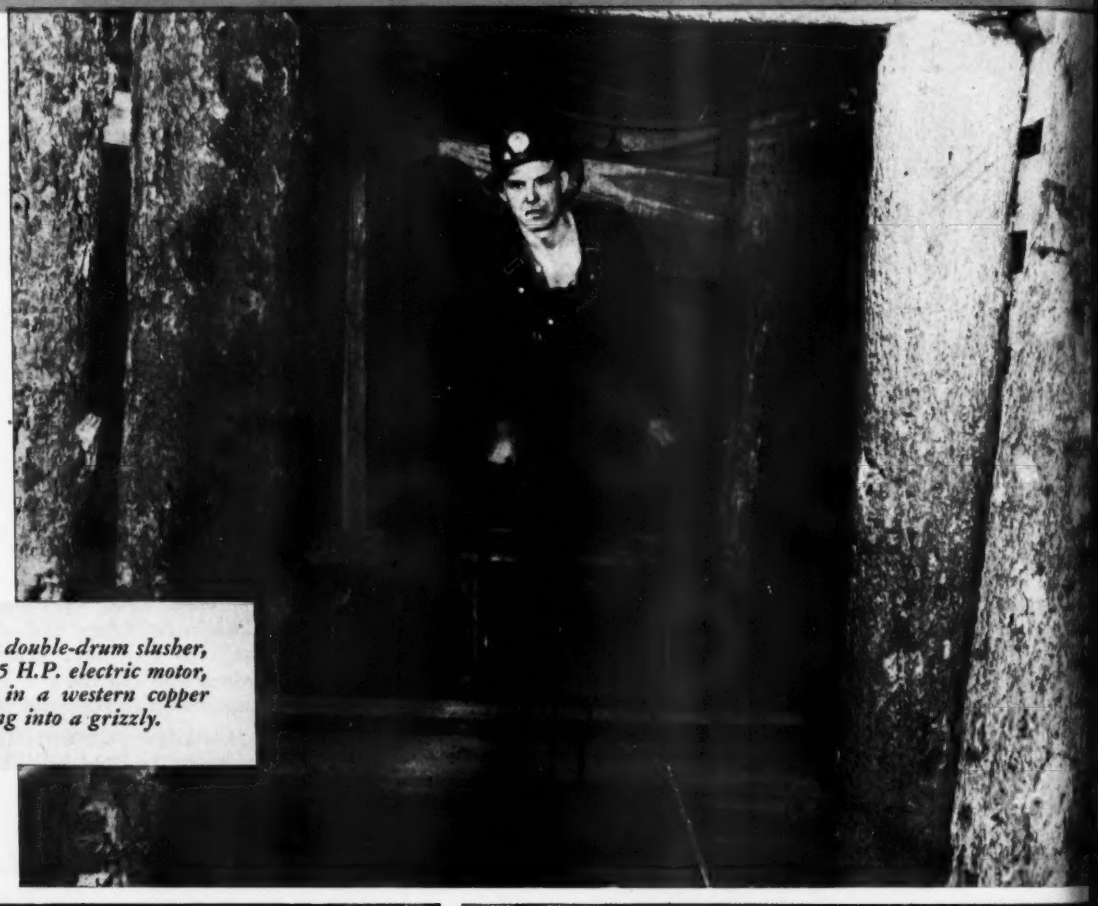
★ Stoper jumbo — self-propelled with its own integral dust-collection system for positive dust control, the latest thing for roof bolting.

LE ROI COMPANY

RD-39

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, Ohio

JOY SLUSHERS



Joy AAF-211 double-drum slusher, powered by 15 H.P. electric motor, in operation in a western copper mine, scraping into a grizzly.

Joy E-111 Turbinair single-drum hoist on a timber setting operation in a large western mine.

Joy HL-3 Shovel Loader mucking out a drift round in a

Built with JOY'S intimate knowledge of mining problems... they're scraping millions of tons of muck every year

Turbinair driven 5 H.P. S-211 slusher scraping ore in a stope in a western fluorspar mine.

Electric driven CFA-211 double-drum slusher in operation in a Tennessee zinc mine.

25 H.P. B-312 electric slusher scraping ore in a large western Canadian mine.

Ruggedly built to stay underground longer, JOY Slushers stand up under the heaviest loads and toughest conditions to give you that high efficiency found only in machines which are *designed* for the job and *proved* in the mine. Check these features: they assure more tonnage scraped per shift and longer life with less maintenance.

1. Anti-backlash brakes
2. Positive direct lubrication
3. Shield-type anti-friction bearings
4. Wide choice of pulling and tail-rope speeds
5. Universal rope guides and rope guards
6. Cast steel skid-type frames
7. Large drum diameters
8. Easily removable clutch bands
9. Simple clutch adjustment
10. Gearing enclosed for protection from dirt and dripping water

There's a JOY Slusher in a size and type for every scraping job. You need only to consult a Joy Engineer to get your answer. He can recommend the best loading equipment for your needs because Joy manufactures the only *complete* line of rock loading equipment for mines . . . slushers, track-mounted shovel loaders, and continuous-type trackless loaders.

WRITE FOR BULLETIN 76-Y

Consult a Joy Engineer

1851-1951 . . . 100 YEARS OF ENGINEERING LEADERSHIP

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Cummins® Diesels
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Shovels, cranes, industrial locomotives

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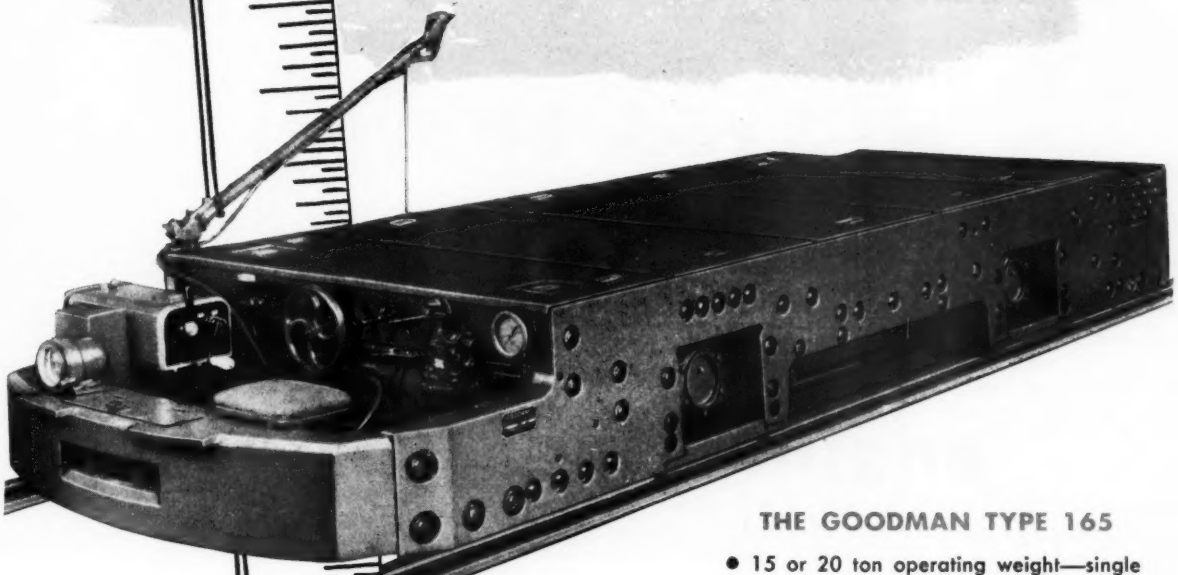

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CALUMET Viscous Lubricants — On open gears and wire ropes, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire ropes.

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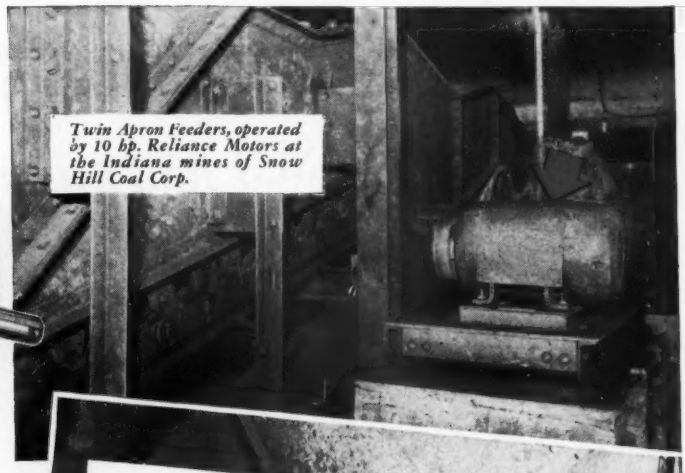

Twin Apron Feeders, operated by 10 hp. Reliance Motors at the Indiana mines of Snow Hill Coal Corp.

Weigh Pan Gate operated by 15 hp. Reliance Motor at Snow Hill mine.

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AN UNDERGROUND MOVEMENT THAT INCREASES AMERICA'S STRENGTH

Shaftsite at the Greater Butte Project. Ore will be mined by the block-caving method. The shaft is now 1361 feet deep; will be one of the world's largest when completed. Headframe (center) is 178 feet high. Ore bins are at left; hoist house at right.

Not all that's red is America's enemy.

We have no mightier ally in our mobilization effort than that versatile red metal—copper.

The Greater Butte Project, pictured here, was begun by Anaconda in 1948. It will start delivering copper ore of low grade early in 1952 at the rate of 6,000 tons a day. Eventual output is expected to reach 15,000 tons a day, resulting in an increased copper production of 90,000,000 pounds a year. This is in addition to continued output of copper, zinc and manganese ores from existing underground mines.

This giant Montana project . . . but one phase in Anaconda's tremendous expansion, improvement and modernization program . . . will cost some $27,000,000. Every dollar is a sound investment in America's defense today—in America's progress and prosperity tomorrow.

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In Memoriam

DONALD A. CALLAHAN, Vice-President and Director, American Mining Congress, passed away October 26, 1951 in Los Angeles, where he was attending the 1951 Convention of the American Mining Congress. On Sunday, October 21, he had just completed his work as Chairman of the Resolutions Committee before being taken to the hospital in what proved to be his last illness.

The following tribute bespeaks the deep respect and affection in which he was held by the entire mining industry.

BE IT RESOLVED: That the AMERICAN MINING CONGRESS records its profound sorrow at the death of Donald A. Callahan, vice-president and director of this organization for the past 18 years. With his passing the mining industry has lost a true friend and counselor, a man who has contributed immeasurably to the industry's advancement.

Endowed with a strength of character and an eloquence rarely encountered, Donald Callahan was a force for good in all that he undertook. For many years, at conventions of the American Mining Congress and of other organizations, he served as chairman of the Resolutions Committee which was charged with preparing a statement of the industry's position on questions of public policy. The resulting "Declarations," recognized as authoritative expositions of mining's viewpoint, have exerted a profound influence on the course of national policies affecting the mining industry.

The inspirational quality of many of these declarations has reflected in no small measure Donald Callahan's own clear understanding of the industry's problems, his faculty for forthright expression, and his unswerving adherence to principles which he knew to be right.

But his services did not end in the framing of resolutions. With his complete grasp of mining's problems and his power of clear and forceful statement, he was a tower of strength in the industry's efforts to obtain fair treatment under the tax laws and other Federal statutes.

Donald Callahan was eminently fitted for the position he occupied as "Elder Statesman" in the mineral industry. His broad experience as president of various mining companies and his many other associations with the industry provided him with a deep insight into its needs. His services to state and country as a member of the bar, newspaper publisher, member of Idaho's House of Representatives and Senate, and leading citizen in his own community gave him a knowledge of men and government seldom equalled.

The knowledge and experience thus gained in his 75 years were tempered into wisdom by his common sense, rugged honesty, dynamic energy and tenacity of purpose. These, together with his simple devotion and faith in God, and his consideration for his fellowmen, inspired the love and respect of all.

For Donald A. Callahan no written tribute can be adequate—let his life be his epitaph. We can only express here, albeit imperfectly, the magnitude of our grief and our profound sense of loss at his passing, and convey to his loved ones our deepest and most sincere sympathy.

Cable should be payed out and taken up as the machine moves

Care and Maintenance of Portable Electrical Mine Cables

Proper Cable Care and Maintenance Will Pay Off In Less Down-Time and Greater Production in the Nation's Mines

By W. T. PEIRCE
Chief Cable Engineer
American Steel & Wire Co.

TREMENDOUS strides in the use of mechanized equipment in coal mining have been accompanied by a corresponding increased use of portable electrical cables to service them. It is natural to expect maximum production from new equipment even to the extent of considering the cable as expendable. The result is often unsatisfactory service life for cables and a general overall life far below what might reasonably be obtained.

It is not always realized by the operator of equipment, that delays caused by cable failure cost more in coal production than does the time necessary for reasonable care. It is somewhat more obvious to the mine operator that cable costs are an appreciable part of equipment operating costs.

In many mines, where cable operation is carefully supervised, life of several years is common, whereas in others, cable lasts but a few months or even weeks. It is obvious that considerable economy can be realized by proper cable care.

Causes for Failure

Operating conditions vary so widely that general rules cannot be laid down, but certain common causes of cable failure can be outlined, together with suggestions for their avoidance. Among these are:

(1) *Cutting of Cables by Mine Car Wheels*

It is desirable to supply the smallest cable practical for service to permit the use of smaller take-up reels and a longer working radius from the point of power supply. The manufacturers and the U. S. Bureau of Mines have set up dimensional limitations to provide reasonable service, together with uniformity of size for cable entrances and explosion-proof junction boxes. This limits what the manufacturer can do to provide additional mechanical protection to the cables. A tight fitting wheel flange on mine car or locomotive will shear off any cable that can be built or at least cut the insulation badly. It is necessary that operators take the trouble to keep cables off the tracks. Where track crossings are unavoidable, it is sometimes possible to put up warnings to permit the cable to be lifted for passage of the car or to provide metal guards to permit passage of the wheels without damage to the cables. Or the cable may be suspended on posts or roof bolts at clearance height across the track.

Education is a necessity and can best be accomplished by insisting that a record be kept of all repairs on each machine, together with the cause of the failure. This emphasizes the responsibility of the operator whereas his normal reaction is to put the blame on the design of the cable.

(2) *Damage Due to Off-Track Equipment*

Normally, rubber tires will not damage cable, but if the cable is resting on a hard surface or sharp rocks, damage is likely. Cables crossing frequently used passages should

be protected on either side by planks. Here again education is necessary for the machine operator, to keep his cable clear of his own wheels and protected from sharp rocks, and for haulage men, to spend a little extra time in avoiding cable for the benefit of smoother production of coal from the cutters and loaders.

(3) *Pinching Against Ribs*

In turning off entries, rooms and break-throughs, adequate cable clearance and guards to protect the cable should be provided wherever possible.

(4) *Excessive Dragging of Cable Under Heavy Tension*

For best operation, cable should be payed out and taken in as the machine moves. To this end, cable take-up reel controls should be arranged for convenient manipulation by the operator, with slip clutches or speed controls to avoid heavy tension on the cable. A well trained operator, who appreciates the value to him and the company of the cable involved, can avoid much trouble by a little care.

(5) *Kinking and Knotting of the Cable*

A common practice is to snub the cable with a knot over a driven spike. These knots upset the structure of the cable, break the re-inforcing threads in the jacket and make the cable prone to kink at some later time. If convenient cable clamps or woven wire baskets grips are provided, the danger of pulling loose from connectors is avoided and longer life is obtained.

A second cause for twisted and kinked cable is improper spooling on the take-up drum, especially noticeable in the flat twin type. This is due to improper adjustment of the distributor which lays the cable on the drum. The distributors should be adjusted to lay the cable smoothly on the drums and to reverse instantaneously at the end of the travel. Otherwise the cable will pile up and the uneven pull on the conductors will cause one to stretch, resulting in a cork screw appearance.

(6) *Cuts and Abrasion*

Cuts due to rock falls are unavoidable, but cable should never be pulled from under a rock fall. In many cases it may be possible to provide a labor crew to remove the material from the cable by hand.

Frequently cables that have worn out prematurely are found with regularly occurring cuts or deep abrasions. These are caused by cable guides or sheaves which have been worn to sharp cutting edges. Equipment inspection at regular intervals and the removal of all worn cable guides will eliminate this source of wear.

Equipment should also be gone over to make sure that there are no rotating gears or wheels that can come in contact with any cable lying slack under the machine or on the drum. The cost of guards will be repaid many times out of savings from less lost time and longer cable service.

(7) *Cable Overheating*

It is not well known that the mechanical strength of rubber falls off rapidly with heating. Moreover, permanent injury is done if the temperatures are excessive or of long duration.

Cables should be chosen with carrying capacities adequate for the normal load even at the expense of using a larger and more expensive cable. The tables in Part 7 of the Insulated Power Cable Engineers Association General Specifications for Wire and Cable give recommended carrying capacity for cables of various types. Especial note should be made for reduction factors in paragraph 7. 2. 24 which reads:

"When the cables are used with one or more layers wound on a gathering reel, the current carrying capacities shall be corrected as follows:

One layer..	0.85 of specified value
Two layers..	0.65 of specified value
Three layers	0.45 of specified value
Four layers.	0.35 of specified value"

The factor of greatest importance to the temperature rise of the cable is its surface radiation. This is of far greater importance than the materials of which the cable is constructed. Consequently, cables should not be covered with materials of high thermal resistance or have their ability to radiate heat impaired by having several layers on the take-up drums in poorly ventilated enclosures.

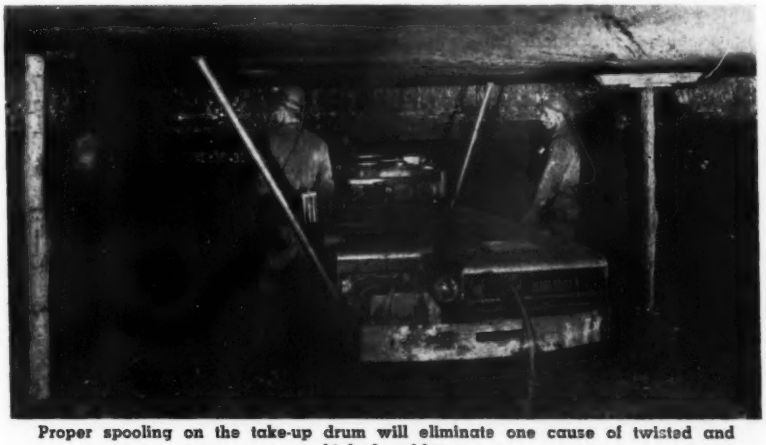
Where the machine is working for long periods close to its supply, the cable should be coiled loosely near the supply with only one or two layers on the drum. If the cable on the supply drum is hot to the touch, ventilation of the enclosure by forced means will pay dividends.

Educate Against Failures

It is a universal experience that men will not take the initiative in getting better service life out of equipment unless management takes an equal interest in seeing that the details for which it is responsible are also carefully considered.

Several steps can be taken to accomplish this. The first is to alert all supervisors to the loss in production and operating costs entailed by poor service life of cables. They will then be on the look-out for the conditions enumerated above that cause early cable failure and can correct them. The next step is to set up a record system of cable life by machines and by causes of failure. This will serve to interest the operators in cable performance and point out the causes for failure and enable remedial action to be taken. After these steps have been taken, individual operator education will be most effective.

It is not to be inferred that the cable manufacturer has no responsibility in supplying the most rugged cable possible with the materials available to him. Much progress has been made in designing better cables. Neoprene jackets have replaced natural rubber, giving improved resistance to heat, aging, and contact with oils.



Proper spooling on the take-up drum will eliminate one cause of twisted and kinked cables

Cable Designs Differ

One design for sheath reinforcement on twin type cable includes a web of sheath material extruded integrally with the sheath. The web serves as a separator between the insulated conductors, or conductors and ground strand; it also bridges between and reinforces the flat sheath surfaces. Such reinforcement prevents distortion and loosening of the sheath, with its attendant longitudinal movement with respect to the conductors. Longitudinal movement results in bunching, followed by tear-

In laying out room entrances, adequate cable clearance should be provided

ing or rupturing during the reeling up cycle of operation.

For similar reasons adhesion is provided between conductors and sheath. Also, an openly applied braid of cotton yarn is woven over the insulation of conductor for its restraining action on longitudinal conductor movement.

This locking together of the various cable components is of importance as it causes all members (insulated conductors, ground strand, and sheath) to flex or slide as a unit. Independent movement of individual units results in distortion and twisting of the cable assembly.

In contrast to the design objective for twin cable, with components locked together, multiple conductor round cables are designed for independent movement of conductors relative to each other and to the over-all sheath. Such provision for independent movement provides a more flexible cable, and permits bending to small radii without kinking of conductor strands.

Three and four conductor cables without ground strands (Type W) are manufactured with cellulose tapes applied as an outer covering around each insulated conductor. The smooth surface of these tapes allows each conductor to slide easily against the others and eliminates all adhesion between conductors and sheath.

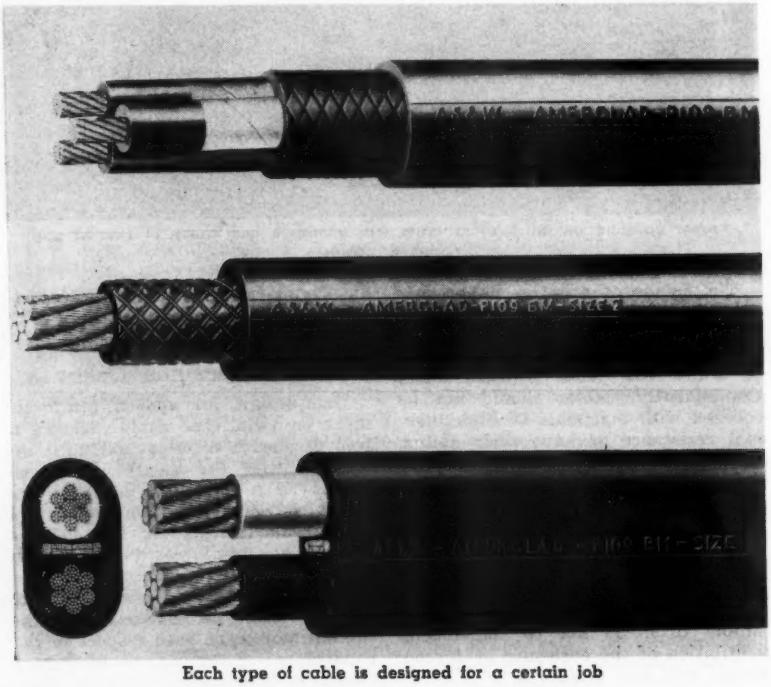
Similar cables with ground strands (Type G) are produced with a stretchable paper tape binder between assembled conductors and outer jacket. This feature frees conductors and ground strands from the restraining action of contact with the jacket material.

Good Insulation Vital

Common to all types of trailing cables, conductor insulation is designed for optimum electrical properties of high voltage breakdown and high insulation resistance. In addition, the best in mechanical characteristics is necessary for hard service conditions. High strength to resist stretching due to the rolling action of pulling cable around reel distributor pins is a basic requirement—for twin type cable particularly. Good compression and cutting resistance is necessary to resist crushing of the insulation wall by the excessive pressure developed when heavy equipment runs over the cable.

Adequate conductor design, although now well standardized, is an important consideration. Flexibility (ease of bending) and low bending stress in wires of strand to avoid fatigue failure are primary design objectives. Such objectives are attained in the "Compound" (rope type) assemblies of small size wires in 133 wire and 259 wire conductors now in common use. This type of assembly permits freedom of movement of individual wires in bending, small diameter wires capable of bending without development of high internal stress, and reversed directions of lay in assembly to resist twisting.

To take advantage of these improvements in design, operators must be persuaded to have more consideration for their trailing cables.



Each type of cable is designed for a certain job

Repairs Important

In spite of all precautions, cables will be damaged under conditions of mine service. Repairs made in the mines are at best temporary and should be so considered.

The common method of splicing conductors is to lay the two conductor ends side by side and clamp them together with a ¼ in. wide steel strap. The surface of the original insulation is cleaned with sand paper or a clean wire brush and self-vulcanizing rubber splicing tape wrapped over the conductors and original insulation on either end of the repair. A layer of friction tape is applied over the individual conductors and as a binder over the assembled conductors. It is extremely important that the ground wires be spliced in a similar manner at each such repair.

As such a repair is only temporary, at the first opportunity or when the cable has two or more repairs, a spare length should be put on the machine and the cable returned to the shop for more permanent repair.

The equipment required for these repairs is a series of molds which can

(*Continued on page 64*)

A temporary headframe 50 ft high was erected for sinking operations at Friedensville, Pa. mine of New Jersey Zinc Co.

Water Problems in Shaft Sinking At Friedensville, Pa.

In Spite of Bad Ground and Heavy Water Flow, Shaft Has Reached 910 Ft Depth

By FRED D. WRIGHT
Mining Engineer, Bureau of Mines, U. S. Department of the Interior
ROBERT L. LOOFBOUROW
Manager Mining Division,
and
FRANK J. KANE
Shaft Superintendent,
E. J. Longyear Co.

UNIQUE grouting and concreting methods being employed to sink the Friedensville, Pa., shaft of the New Jersey Zinc Company of Pennsylvania provide an example of modern ingenuity meeting a difficult water problem.

The seven-compartment shaft is being sunk by the E. J. Longyear Co. under contract to the New Jersey Zinc Co. of Pennsylvania. Preparation for shaft sinking was started July 1, 1947. By September 7, 1951, the shaft had reached a depth of 910 ft. Its final depth will be 1265 ft.

The shaft is in the hanging wall of a zinc ore body. The country rock is a fractured, water-saturated dolomite oxidized and decomposed to a depth of many hundred feet. Numerous connected solution cavities within the dolomite are partly or completely filled with clay.

The principal factor in selecting the shaft site was hydrologic. Test holes indicated that the country rock was somewhat less fractured and decomposed at this location than at any other in the vicinity of the orebody.

Shaft walls are supported by steel sets spaced 7 ft apart vertically and by a reinforced-concrete lining which has a minimum thickness of 18 in. to a depth of 430 ft and 12 in. below this point. Inside the concrete the shaft is 13 by 20½ ft and is divided into two skip compartments, one supply-cage compartment, one for a counterweight for the cage, one for a ladderway, one for pipes, and one for electric cables.

Level stations on the 400-, 600-, 700-, 800-, and 900-ft levels and for pump stations on the 418- and 818-ft levels have been excavated as the shaft was sunk. Level stations consist of crosscuts 128 ft long, 10 by 16 ft in cross-section for 50 ft and 10 by 10 ft for the rest of their length. Temporary reinforced-concrete bulkheads with heavy steel doors are installed 75 ft from the shaft to protect against flooding.

Sink Top Section

At the top of the shaft a 60-ft section was sunk through the overburden by driving a steel sheet piling cofferdam 30 by 30 ft to bedrock. The material inside this cofferdam was then excavated by a crane with a ¾-cu yd clamshell bucket. Nine steel sets were hung, and the shaft was lined with reinforced concrete and sealed to bedrock. Concrete bearing surface on bedrock is 10 ft wide and the height of this concrete ring is 6 ft. Above this, to the surface, the horizontal thickness of the concrete is 4 ft.

A 50-ft temporary headframe equipped with two 6-ft sheaves and an air-operated dump door, was installed. A 50-cu ft bucket, attached to a safety crosshead and a one-in. cable, is used for hoisting rock. The shaft rock is dumped through a chute directly into trucks and used for fill in the plant area. A shaft mucking machine, a pump discharge line, sinking pumps, air and drill-water lines, and a ventilation pipe were then installed in the shaft.

Operations are carried on regularly, three shifts a day, seven days a week. The working force consists of 42 men; an engineer, a timekeeper, three shift bosses, three surface men, three hoisters, three landers, an electrician, a carpenter, a mechanic, a mechanic's helper, and 24 miners.

Choose Pressure Grouting

Because of the successful results obtained in sinking shafts through water-bearing formations by pressure grouting, this method was adopted for the Friedensville shaft. Alternatives were carefully considered, but this was most feasible in view of all known circumstances.

Grout mixers and a high-pressure pump are used in this work. Continuous flow of grout is secured by the use of two mixing tanks. While grout is being pumped from one tank, the other is being filled with the correct amounts of cement, water, and Prepakt Aid. Sand or fly ash is also added when large amounts of grout are required to fill a big cavity.

Pregrouting Fails

First step in sinking was to pretreat the dolomite to a depth of about 325 ft. This work started July 1, 1947, was completed February 3, 1948.

Eighteen holes, 325 to 350-ft deep, spaced 10 ft apart and 10 ft outside the perimeter of the proposed shaft, were drilled and grouted. Later seven additional holes were drilled and grouted.

Each hole was drilled until an open fracture was indicated by loss of drill water. Attempts were made to wash between holes to clean out as much clay as possible. Grout injection was started and continued until pump-refusal pressure of 700 psi was reached. After the grout had set, the holes were redrilled and deepened until another open fracture was penetrated. Then grouting was repeated.

The first batch of grout pumped into a hole was mixed with 45 gal of water. Fluidity was then gradually decreased until only 25 gal of water were used per batch.

Grout appeared at the ground surface in several places within a 100-ft radius of the shaft. Later experience indicated that the refusal pressure of 700 psi was too great and resulted in a needlessly long travel of grout. Pretreatment was unsuccessful in that: (a) The shaft was flooded three times within the 325 ft pregrouted; (b) sinking was only possible by regular and elaborate test holing, washing and grouting conducted from the shaft bottom; and (c) no large volumes of grout were seen in sinking.

Clay in the cavities is considered the cardinal reason for failure of this pretreatment. It was not possible to wash clay through widely spaced holes drilled from above the water table. Washing and effective grouting had to be done underground.

Retreatment Successful

Sinking had progressed to a depth of only 73 ft when a heavy flow of water broke into the shaft. Since then, the dolomite has been re-treated in stages by holes drilled from the shaft and horizontal workings.

Test holes are drilled from the shaft into the rock surrounding the sides and bottom of the shaft. Initially all these holes were diamond drilled.

A sheet steel piling cofferdam was driven before excavating the top 60 ft. of shaft

Later, percussion drills were introduced for this work, and now diamond drills are used only for holes deeper than 32 ft. The standard test-hole pattern, varied to meet special conditions, consists of alternate rings of 20- and 28-ft test holes. There are 20 holes in each ring. If no water or clay is encountered, the shaft is sunk another 7 or 14 ft before the next ring of test holes is drilled. A minimum of two vertical test holes, 28 ft long, is drilled into the floor of the shaft ahead of each round.

If water or clay is encountered, drilling is discontinued, and an insert is forced into the hole. This insert consists of two telescoping pipes and a short length of rubber hose. The hose is fitted over an inner ¾-in. pipe between an outer 1¼-in. pipe and a collar at one end of the inner pipe. The insert is sealed into the hole by tightening a wing nut which forces the outer pipe against the rubber hose and compresses it against the side of the hole. A valve is attached to control water flow.

In the first 200 ft of shaft, test holes that encountered clay as well as water were thoroughly washed with water and compressed air at 100 psi. This was essential for successful grouting, and every effort, including drilling of extra holes, was made to establish connection between test holes.

Below 200 ft static water pressure precludes washing, so holes that strike clay are allowed to drain into the shaft until the water from them runs clear.

Grouting is started after the pressure of the water in the drill holes is measured. Grout is injected until it starts coming out of connecting holes. The valves on these holes are then closed, and grouting of the first hole is continued to a pressure 20-50 psi greater than the water pressure. If no additional back pressure builds up as the grout is injected, it is assumed that the hole penetrates a large cavity. In such a case, sand or fly ash is added to the cement and water, and grout is pumped alternately into connecting holes until the cavity is filled. Rotation from hole to hole allows the grout to build up in layers on the walls of a cavity until it is sealed.

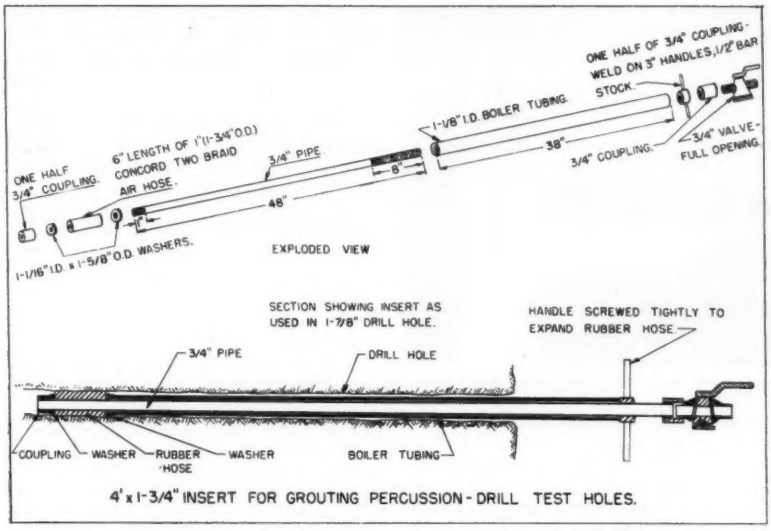
After grout has set, holes are tested by redrilling, sometimes deepening diamond drill holes or by drilling new percussion holes alongside grouted ones. The cycles of drilling and grouting are repeated until all holes have been tested to their complete depth.

Even the most careful grouting and most elaborate drill pattern cannot always insure complete sealing of all watercourses. Open cracks not intersected by any of the test holes have been found only a few inches from a grouted hole.

Bulkhead Shaft Bottom

Where rock in the bottom of the shaft is very badly fractured and decomposed, a concrete pad is poured to help retain the grout.

A 12 by 36 by 28-in. steel box with perforated sides and open bottom is placed on the floor of the shaft. Two 3-in. pipes are welded into holes cut in the top of the box. One is used for pumping and is equipped with a foot valve and screen. Casing pipes for each of the test holes that will be drilled through the pad are correctly



Test holes were sealed with ingenious insert before grouting

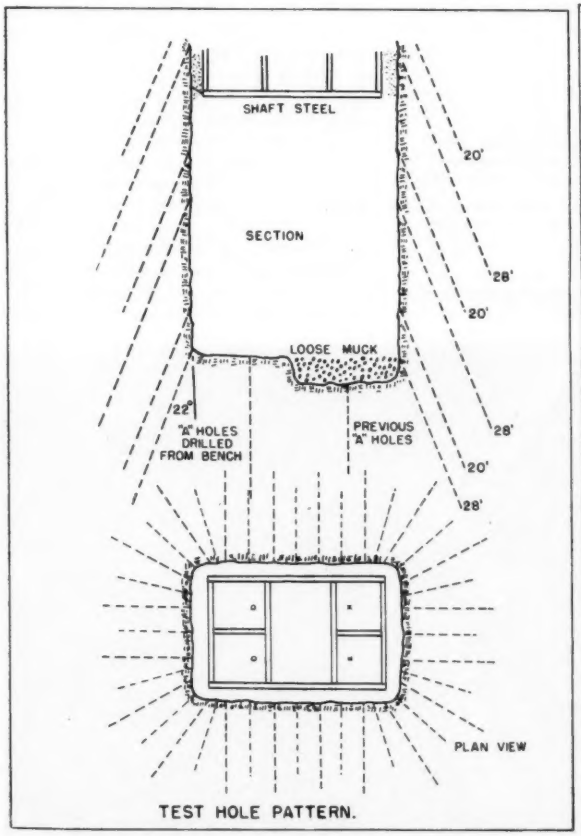
located and alined. Canvas curtains are hung to deflect water dripping down the shaft onto an H-beam wall plate, which serves as a water collecting ring. Four grout pipes and one to carry water from the collecting ring to the shaft bottom are installed. A layer of crushed limestone is then placed on the bottom of the shaft, and a tight tongue-and-grove plank floor laid over the stone and caulked around the edges. Finally about 50 cu yd of concrete are placed on top of the floor to form a pad three ft thick.

During the initial setting time of the green concrete, all water seeping into the bottom of the shaft, including the water from the collecting ring, is pumped from the crushed stone below the pad. After that, water is allowed to come up through the pipes in the pad, and pumping is continued from above the pad until the concrete sets. Grout is then injected into the crushed stone at a pressure of 50 psi. After this sets, drilling of test holes and grouting proceed. The pad is later broken with paving breakers, and shaft sinking is resumed.

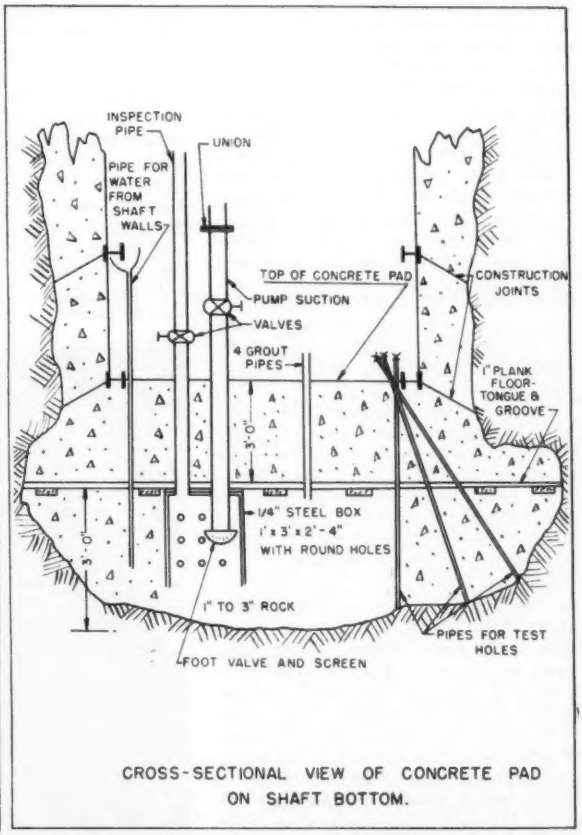
Underwater Plugs Set

On January 6, 1949, a shaft round was blasted and mucking started at 5 a. m. The sinking pump was discharging 100 gpm. At 5:15 the shift boss noted muddy water entering the bottom of the shaft. The flow increased so rapidly that the miners could not remove the mucking machine or pump. Within 30 minutes the water had risen 127 ft in the shaft, 23 ft from the surface. This amounted to an average flow of 8000 gpm. Five pumps with a combined capacity of 3450 gpm were placed in operation, but the water was lowered only 13 ft.

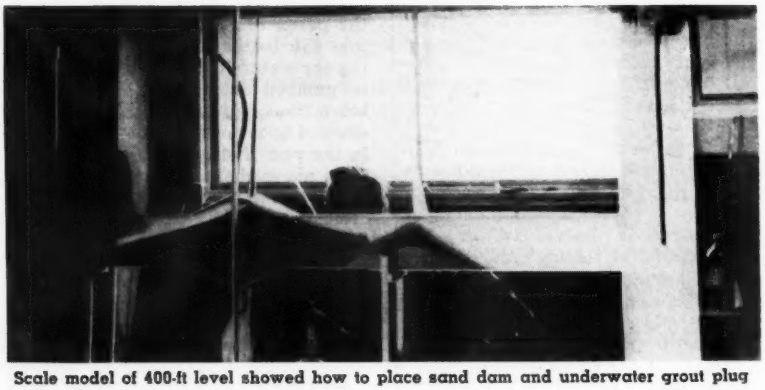
It was evident that an underwater



Standard test hole pattern was varied to meet ground conditions



Concrete pad on shaft bottom helped retain grout in fractured ground



Scale model of 400-ft level showed how to place sand dam and underwater grout plug

plug would have to be placed, but first the mucking machine and sinking pump had to be removed. A deep-sea diver was called in and arrived with his assistant, and all equipment on January 11. The diver made two 40-min descents the first day and cleared all bolts and cables. The following morning he hooked the hoist cable onto the mucking machine assembly and clamshell and assisted in their removal from the shaft. That afternoon he made the last descent and removed the sinking pump. A considerable amount of mud was cleaned from the shaft by scouring the bottom, with a compressed air sump pump and long blow pipes.

Pumping was discontinued, and a typical underwater plug poured. Ten guide pipes, 2 in. in diam and slotted 10 ft at their ends, were lowered almost to the bottom of the shaft. Nine ¾-in. grout pipes were then lowered inside nine of the guide pipes.

Crushed limestone, ¾ to 3 in. in size, was poured through a 20-in. ventilation pipe and through the pipe used for concreting until the crushed stone layer was 14 ft thick. Measurements were taken at several places to check the thickness and distribution of the stone. The top surface of the crushed rock was virtually level.

Three triplex pumps forced grout into the crushed stone simultaneously through nine pipes until all the voids in the crushed rock were filled. After three days, the water was pumped out of the shaft, the steel sets cleaned, and drilling and grouting of test holes through the plug was started.

Several details are important in successfully pouring an underwater plug. First, the exact location vertically of the outer grout or guide pipes must be known. They are lowered within a foot of the shaft bottom before a plug is poured. The inner ¾-in. pipes are at first lowered within two feet of the bottom of the outer pipe and are then raised as the level of the grout rises. Pumping of the grout through nine pipes at a time is distributed among all 10 guide pipes. The level of the grout can be measured by a plumb bob through the extra guide pipe.

It is important to prevent any air leakage into grout lines. Suction is thus maintained, and grout cannot drop freely through the line. If it did, it would have such a high velocity at bottom that it would disperse. When pumped slowly, the grout builds up in flat cones and fills the voids in the crushed stone.

Flood from Level Stopped

After the initial drift on the 400-ft level had been driven to 128 ft, a hitch for a concrete bulkhead was started about 75 ft from the shaft. The hitch had been cut in the back and on the sides of the drift, and a round into the floor had been drilled and blasted, when a sudden burst of water entered the workings from a large, mud-filled fracture opened by the blast. This mishap occurred although the level had been test-drilled and grouted while it was being driven and again test-holed at the site of the widening.

Within three hours the shaft was again flooded to within 23 ft of the surface. Calculated flow into the shaft this time was 20,000 gpm.

A plan to construct an underwater plug was first tested on a plexiglass model. In essence, the plan consisted of forming a sand dam in the station between the fracture and the shaft and then pouring a grout plug into and over the fracture.

Three holes were diamond-drilled from the surface. One of these intersected the level midway between the fracture and the shaft; the other two pierced the roof of the level close to the fracture in the floor.

Although the holes had been surveyed as accurately as possible, it was important to know their exact distance from the sides of the drift or level station. To perform these measurements, an AX casing was slotted and notched at the bottom. A ½-in. rod six ft long was hinged to the casing by means of a shear pin in such a manner that, when lowered into the drift on a string of matched casing, the rod dropped down at right angles to the casing and was held in that position. The casing was then rotated at the surface until the rod touched one side of the drift and then the other. The angle turned was measured, and the exact distance of the drill hole from one side of the level calculated. When the casing was pulled, the pin holding the ½-in. rod was sheared and the rod dropped to the level. The hole to be used for the sand barrier was 4 ft from one side of the shaft station and about 12 ft from the other side.

The forming of the sand dam was then started. First sand was washed directly down the drill hole until a large, flat cone was formed on the level directly under the hole. Then a length of AX casing, with a window cut in one side was plugged at the bottom and lowered down the hole.

Concrete for shaft lining flowed from heading box into forms through "elephant trunk" pouring pipe

The window was turned to point across the level and sand was washed down the pipe, until the barrier was completed.

Grout was then pumped down a pipe through the drill hole nearest the fracture. Soon after the grouting was begun, the water level in the shaft dropped 16 in. Later the water level rose slowly again at a rate equal to the volume of grout that was being pumped. This same phenomenon was observed when the underwater plugs were poured, in the shaft. It is believed that the grout, which is heavier than water, flows downward into an existing fracture at sufficient velocity to draw water along with it. When the fracture has been filled, the water in the shaft is displaced by additional grout and starts to rise again.

Table 1.—Summary of engineering data, July 1, 1947 to July 1, 1951

Item	Amount
Shaft excavation—linear feet	835
Level excavation—linear feet	575
Concrete lining in shaft—linear feet	805
Test holes from surface (including redrilling grouted sections)—feet	59,887
Test holes from shaft (including redrilling grouted sections)—feet	52,448
Test holes from levels (including redrilling grouted sections)—feet	33,973

Table 2.—Summary of labor requirements, July 1, 1947 to July 1, 1951

Item	Man-hours	Pro rata share of I, man-hours	Total man-hours	Man-hours per foot of shaft	Percentage of total man-hours
I. Hoisting and landing	46,762				
II. Surface installations					
A. Headframe	1,455				
B. Surface installations, utilities, office operations	47,617		49,072	58.7	11.5
III. Hydrology					
A. Building wier, measuring flow and levels of water	13,139	872	14,011	16.8	3.3
IV. Permanent work					
A. Skip roads	1,255				
B. Power cables	607				
C. 10-inch air lines	1,088	436	3,386	4.1	0.8
V. Shaft excavation and concreting					
A. Excavation	57,358				
B. Concrete forms	37,262				
C. Concreting	9,490	18,863	122,973	147.3	29.0
VI. Grouting					
A. Grout from surface	62,856				
B. Leaks in shaft walls	2,014				
C. Grout from shaft, pads, and plugs	56,859				
D. Installation of grout pipes	5,241				
E. Plug on 400-foot level	27,886				
F. Grouting from the levels	19,316	20,182	194,354	232.7	46.0
VII. Excavation of levels	26,097	4,727	30,824	36.9	7.0
VIII. Bulkheads in levels	9,223	1,682	10,905	13.1	2.4
Total	425,525		425,525	509.6	100.0

Table 3.—Concrete and grout requirements, July 1, 1947 to July 1, 1951

Item	Amount	Total Amount	Amount per foot of shaft
Concrete			
Surface installations—cubic yards	162.5		
Lining of shaft and levels—cubic yards	5,595		
Pads—cubic yards	111.3		
Bulkheads—cubic yards	279	6,147.8	7.36
Grout			
In surface holes—cubic feet	135,136		
In shaft test holes and plugs—cubic feet	30,021		
In shaft leaks—cubic feet	1,713		
In test holes from levels—cubic feet	19,189		
In plug on 400 foot level—cubic feet	7,902	193,961	232.3

Although it was realized that the fracture had been plugged when the water level in the shaft started to rise, grouting was continued with a stiff sand-cement mix until the level had been filled to its back. This was done to insure enough weight on the plug to hold it in place after the shaft was unwatered.

In the third diamond-drill hole a bailer was used to measure the height of the grout as it rose in the level.

During the grouting operation, water was pumped continuously from an inverted hood attached to a pipe in the shaft placed just below the 400-ft level. On three occasions, grout was observed in the shaft water. This indicated that the sand barrier was leaking. Grouting was stopped temporarily while more sand was added to the barrier.

After the grout plug had set, the shaft was unwatered and the sand barrier removed. Long holes diamond-drilled from the shaft to the fracture showed it was completely sealed. After the grout in the drift had been broken with paving breakers and removed, a grout "cork" was seen leading into the fracture in the floor of the drift. The concrete bulkhead and its steel doors were installed, and normal operations were resumed.

Drilling and Blasting

Long-hole drilling for grouting is done both with diamond drills and percussion drills. EX size coring and plug bits are generally used for diamond drilling.

Percussion drilling is done with 55-lb sinkers, 1-in. hexagonal drill rods, and detachable insert bits. Drill steels in 4-ft changes with maximum lengths of 32 ft are used. Detachable, tungsten carbide insert bits range from 1⅞ to 1⅝ in. diam, in 1/32-in. increments. The life of the bits averages about 262 ft. Bits cost 5.7 cents and steel 7.25 cents per foot of hole drilled.

Drilling of blast-hole rounds is also done with the same percussion drills, used for long-hole drilling. A normal sump-type round of 42 holes is used to break half the shaft bottom at a time to facilitate pumping. Holes are drilled to 8 ft, and the round generally breaks 7 ft. Eight miners using four machines complete a round in four hr.

Shaft rounds are blasted with 1½-in. by 8-in. 40 percent gelatin and standard electric delay detonators. Circuits, wired in parallel, are fired from a switch at the shaft collar.

An average of 4.81 lb of dynamite per cu yd is used in breaking shaft rounds.

Blasting fumes are exhausted through a 20-in. ventilation tube by a blower connected to a 15-hp motor. It takes about 45 min to clear the smoke.

Broken rock on the shaft bottom is loaded into the 50-cu ft sinking bucket by a Riddell-type shaft mucker with a ⅜-cu yd clamshell. Four men

(Continued on page 69)

Pillar Extraction With Roof Bolts

Greater Recovery and Fewer Accidents have Resulted from the Use of Roof Bolts in Retreat Work at Five West Virginia Coal Mines

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WIDE acceptance of roof bolting has not only resulted in safer mining but has opened up possibilities for the introduction of new methods of mining and the improvement of methods already in use. These factors have a decidedly favorable bearing upon the efficiency of recovery and on the conservation of high-grade metallurgical coal resources.

Several operators in scattered parts of the United States have conducted experiments in roof bolting in pillar recovery. Some have passed the experimental stage and proved the practical applicability to their individual mining conditions.

The U. S. Bureau of Mines has made an investigation of five mines engaged in pillar recovery work in southern West Virginia. Practice at one mine, the largest, is described herein with tables which compare the results of mining with conventional timbering to mining with roof bolting at all five.

Varied Conditions Improved

A problem caused by the previous mining of a seam 55 ft below the actual workings in Mine No. 2 was overcome by bolting. In Mine No. 3, roof bolting permitted a change from wide room mining to the room and pillar system. Bolts at No. 4 Mine allowed taking the 12 to 14 in. of coal previously left for roof protection. And in Mine No. 5, mining under cover ranging from a few feet up to 225 ft was facilitated by bolting. Roof bolting has paid in all of these mines, but was not used in working faces until after an experimental installation was observed.

This report is not an exhaustive treatise on roof stresses, design of mine workings, or the efficient control of associated strata in coal mines, but shows results and points toward the full possibilities of roof bolting.

Description of Mine No. 1

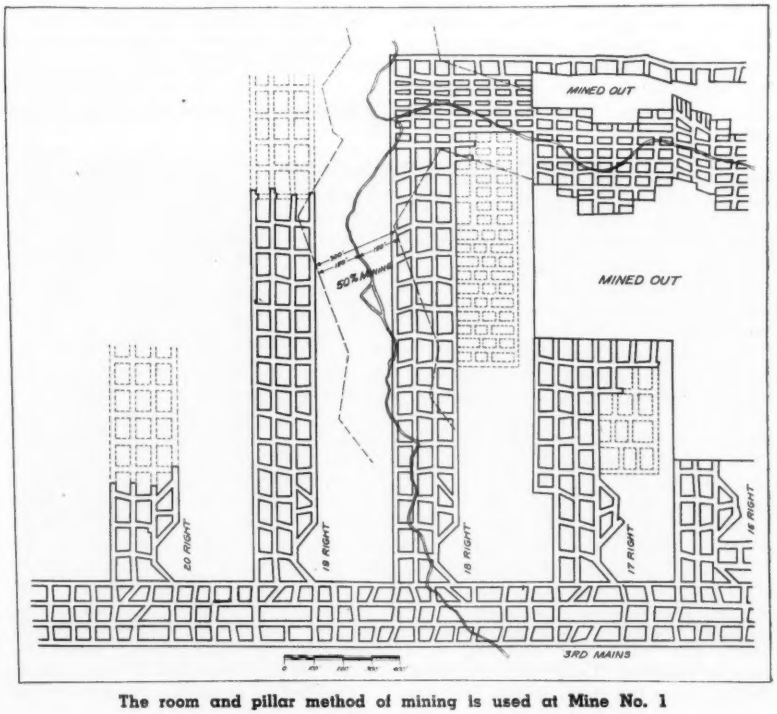
Mine No. 1 is in the No. 3 Pocahontas low-volatile coal bed, which averages 56 in. in thickness in the present working areas and dips two percent. Coal is soft and friable, with no distinct cleavage, and has a cover of 1000 ft.

The mine has eight mechanical sections; one track section, and seven shuttle car sections, all operated triple-shift. Pillars are being extracted on seven sections, and roof bolts used on four of these.

A multiple entry system is used in the development of the main, the panel, and the room or butt entries. Panel entries are driven in groups of four and six, and the room entries were driven in groups of three; however, this number was increased to four shortly after roof bolting was started. Entries are on 70-ft centers and have a maximum width of 16 ft. Rooms, on 95-ft centers, were 16 to 20 ft wide and 200, 270 and 300 ft long. Room widths were recently reduced to a standard 16 ft. Room crosscuts are on 70-ft centers and entry crosscuts on 95-ft centers. Thus, the pillars are divided into blocks approximately 50 ft wide and 75 ft long.

Panel entries are turned at right angles off main entries at 2000-3000 ft intervals. Normally, room entries or butt entries, are driven to within 225 to 300 ft of adjacent panel entries, distances of approximately 1500 to 2500 ft. Length of room entries on which pillar extraction with bolts was first started in this mine was 1800 ft. Usually, the group of butt or room entries is turned at the outby end of the panel, and coal in the panel adjacent to the main entry barrier pillars is mined first; however, the room entries are advanced a predetermined distance before pillar extraction is started on retreat.

Each active section is ventilated by intake air and bleeders are provided for pillared areas. Wet drilling is used to alleviate dust when drilling holes for roof bolting, a rule followed invariably. Air for the roof bolting equipment is piped from stationary compressors located underground.



The room and pillar method of mining is used at Mine No. 1

Roof Is Poor

Generally, the immediate roof in this mine consists of 10 to 22 in. of dark, unconsolidated shale (clod) containing angular planes of weakness, slickensides, kettle bottoms and plates. A thin seam of coal ¼ to 1⅛ in. thick separates this immediate roof from the main roof comprised of thin-bedded gray shale, ranging up to 18 ft, or more, in thickness. In localized areas this main roof is less uniform in character, being comprised of lenticular coal-shale laminations, sandy shale, shaley sandstone intercalations and sandstone extending up to the overlying No. 4 coal bed. Seasonal temperature and humidity changes seriously affect the immediate and the main roof, when exposed, and several falls along the older entries have extended to the limit of arching.

The coal bed is underlain by a firm but loosely consolidated shale, which does not heave excessively, and provides a good roadway when dry, but becomes soft when wet.

Timbering Methods Costly

Roof-control in this mine has been difficult and expensive. Various means and materials have been utilized to support the roof on main and on panel-entry haulageways where the immediate roof has been brushed for height. Timbering methods and materials used in the past include cement coating, mine rails and cross bars (steel and wood) of various dimensions placed on posts and on masonry piers, peg-timbering, "hair-pin" timbering, and hitch-timbering (rails or timbers supported by grooves cut in the ribs).

The conventional method of roof support in working areas where the immediate roof was not taken, consisted of three-piece wooden sets, 8 by 4 in. by 12 ft in dimension, placed on four-ft centers, or less. Prior to roof-bolting, the immediate roof was brushed for height on the room or butt entry haulageways, and then the main roof was supported by the standard cross-bar method. The unstable character of the immediate roof and the lack of adhesion to the next overlying stratum (because of slickensides and intervening thin seam of coal) presented great difficulty, especially during final mining. Usually, before rooms were completed and the pillars extracted, many of the cross bars, broken by excessive weight or weakened through decay, had to be replaced. The immediate roof had to be taken in some of the rooms because of separation from the main roof as the coal was mined. It was invariably necessary to take this stratum when driving pillar lifts or pockets.

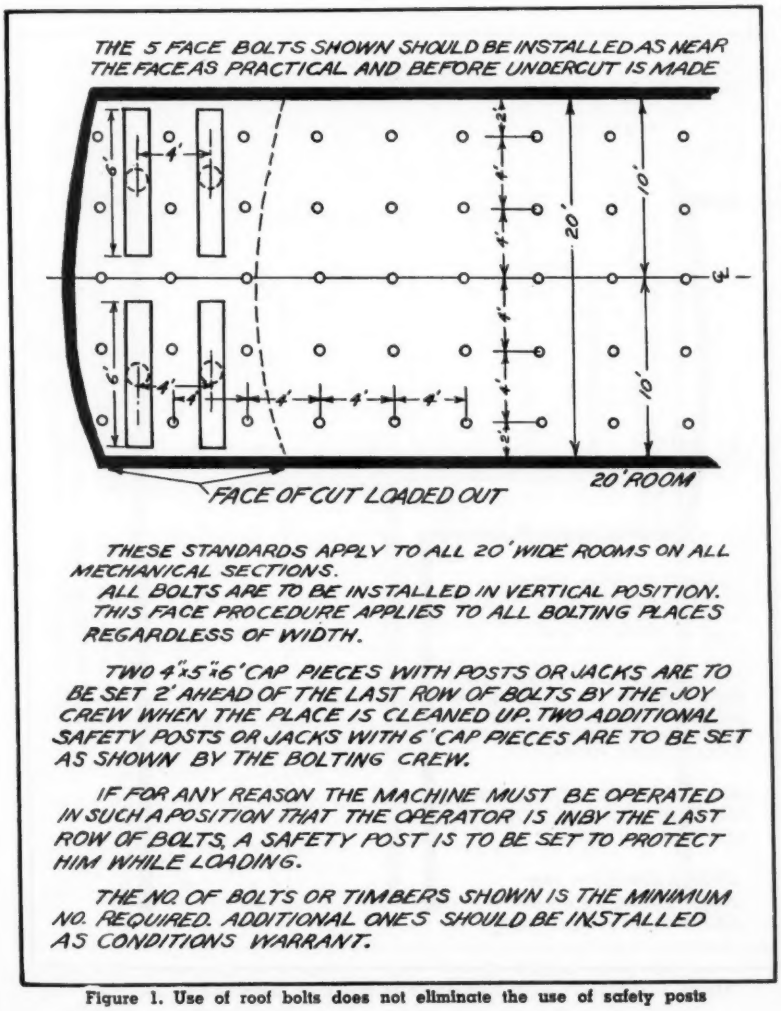


Figure 1. Use of roof bolts does not eliminate the use of safety posts

Bolting Begun in 1949

In July, 1949, after observing and studying two experimental roof-bolting installations for several months, the initial installation of roof bolting was made in the faces of a group of three room entries being driven abreast in Panel A. Four 1-in. diameter bolts, 48 in. long, were installed vertically in rows placed on four-ft centers longitudinally and transversely in the 16-ft entries. The end holes were drilled two ft from the ribs and the intermediate holes four ft from the end holes and four-ft apart. Before crosscuts were turned, six bolts were installed at an angle of about 15° from the vertical, terminating over the coal ribs. Bolts were installed within 24 in. of the face before cutting and blasting. The 1¼-in. holes were 46½ in. deep. Wedges were ¾ by ¾ by 5½ in. and bearing plates, 6 by 10 by ½ in., but later changed to 8 by 8 by ⅜ in. and 6 by 6 by ⅜ in. A stoper was used to drill the holes and to drive the bolts to refusal in the holes and an impact wrench was used to tighten the nuts on the bolts to 200-ft lb, minimum torque.

Roof bolting on this same general plan was started on other sections as additional equipment and materials were received; however, the number of bolts in the rows varied according to widths of the openings that had been made in accordance with previous standard practice. Roof bolting in rooms was started two months later as places were turned in progression near the top end of a group of three entries, which had been driven to within 150 ft of the predetermined distance preparatory to pillar mining. These rooms were 20 ft wide and projected to be driven 270 ft long. In rooms, five bolts are used in rows on the same plan as previously described and shown by figure 1.

Pillar Lifts Bolted

The method of roof bolting used in extraction of pillars in Panel A is shown in figure 2. Later, this plan was changed to that shown in figure 3, because of its inadequacy in supporting kettle bottoms and other roof irregularities encountered. This meth-

Production	Mine No. 1		Mine No. 2		Mine No. 3		Mine No. 4		Mine No. 5	
	Conventional Timbering	Roof Bolting	Conventional Timbering	Roof Bolting	Conventional Timbering	Roof Bolting	Conventional Timbering	Roof Bolting	Conventional Timbering	Roof Bolting
Average tons per section per shift	77	89.1	124	156	75	200	220	250	156.2	218.5
Average tons per man-shift	8.9	9.8	12.17	13.03	7.5	18.2	12.5	17.2	10.41	13.90
Cost of roof support per ton	....	....	.218	.303	.667	.740	.234	.18	0.272	0.535
Cars slate handled per shift & per section	7.6	0.1	....	....	....	....	12	4	20	3
Labor cost (Roof support and handling rock) per ton	....	....	.215	.155	....	....	.30	.18	.321	.545
Conservation										
Estimated overall recovery of bed (percent)	79.70	84.5	70.0	80.53	83.64	96.55	78.0	90.0	70.0	85.0
Safety										
Fatal roof-fall accidents	0	0	1	0	1	0	0	0	0	0
Nonfatal roof-fall accidents	11	1	13	1	41	2	4	0	2	0
Experience										
Acres of pillars extracted using roof bolts		69.77		54.70		43		24		2.18
Tons of coal mined under bolted roof		675,000		439,979		525,360		150,518		54,400

Table I. Comparative results—conventional timbering vs. roof bolts in five southern West Virginia coal mines

od consisted of the use of five or six 1-in. bolts, (the number depending on widths of lifts) 48 in. in length installed in rows on the same pattern and by the same method as previously described for development of entries. Prior to starting lifts in the blocks two rows of breaker posts and one row of turn timbers, consisting of three or four timbers, was set across the openings, as shown in figures 2 and 3.

This technique proved successful in extraction of the pillars in Panel A, and at the time of this report, pillars were being extracted on four similar panels by this general method with slight variations to suit local conditions. In some areas, the soft, unconsolidated clod forming the immediate roof sloughed between bolts or between bolts and ribs, and the kettle bottoms, many of which could not be detected, fell without warning. Because of these hazards, room widths were reduced and it was decided to use untreated 2 by 8 in. by 12-ft cross bars as continuous bearing plates on 3½ and 4-ft centers in the room entries, rooms, and pillars, as shown in figure 3. This method has been successful during the past year. The life expectancy of a butt entry is approximately two years and, it is believed that the wooden beams should, with few exceptions, prove serviceable for that long. Pillar extraction with roof bolts was started in November 1949. Seventeen rooms were driven and the pillars, including the room entry chain pillars, exposing 500,000 sq ft of roof, were mined with bolts used as roof support in this panel within one year.

Pillars were mined by the open-end pocket system. Normally, pillaring is started as soon as a group of room entries has advanced the predetermined distance and rooms 1, 2 and 3 at the top of the panel completed by holing through into previously mined-out areas or advanced a projected distance to form a barrier pillar, 50 to 70 ft thick, subsequently taken with the other blocks. Formerly, rooms were advanced until they cut into previously mined-out areas, but because of the hazard of driving rooms or other openings in which the roof was bolted into unbolted or caved areas, the practice was discontinued. Thus, gob material is prevented from rolling into the working place and canterlevering roof in the gob areas is prevented from caving above bolt anchorage points and extending into active workings. *These hazards warrant more than passing consideration in pillar extraction with roof bolts.*

The pillar line is kept continuous across the room entries and at a 70° angle to the entries. Occasionally

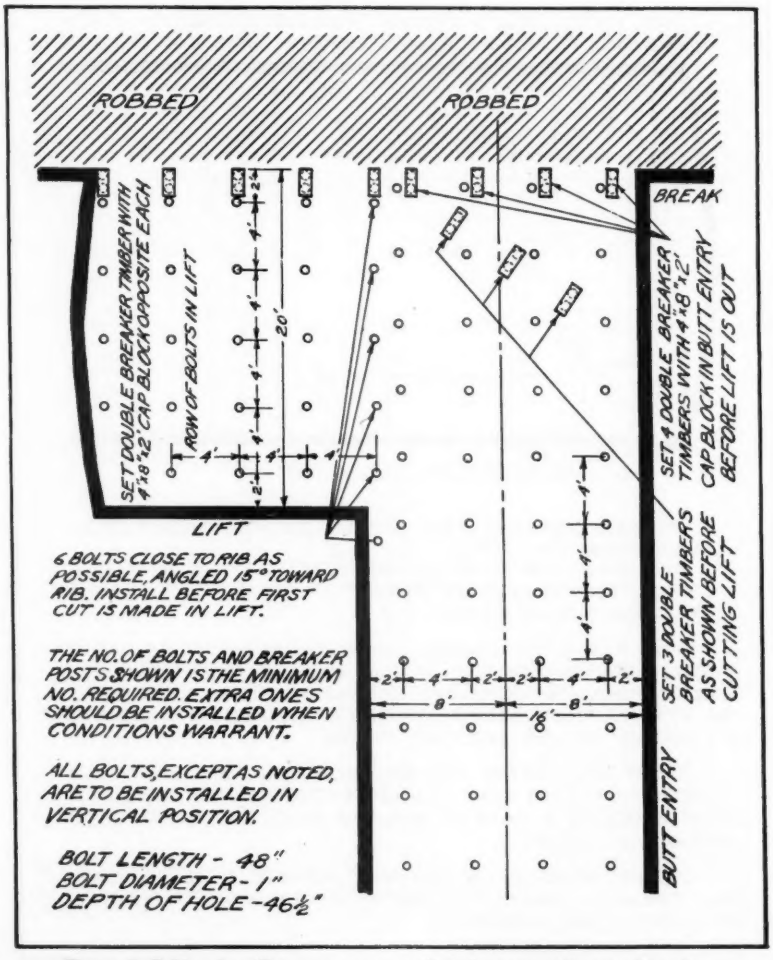


Figure 2. Bolting in pillar recovery was first done according to this plan

this line is broken when it is necessary to leave reserves for surface support but there has been no difficulty experienced in reestablishing the pillar line. About 50 percent of the coal is left in these reserves. Normally, the pillars comprise three lifts of six 8-ft cuts or seven 7-ft cuts approximately 20 to 30 ft wide and a stump 50 ft long and 7 ft thick, which is extracted by taking two cuts, each 25 ft long. The first cuts in the lifts in the blocks are taken from the entry side in entries and from crosscuts in rooms.

Only Three Roof Failures

During the period August 12, 1949, when roof bolting was started up to and including June 13, 1951, a total of 199,465 linear feet, or approximately 37.8 linear miles of roof has been bolted. During this period three "failures" of sections of bolted roof occurred; each of them at intersections of crosscuts between rooms adjacent to the pillar lines. Incidentally, the "failures" occurred when the pillar sections were within three rooms of being completed. The first failure was attributable to excessive widths of the room and crosscuts (as much as 21 ft at some locations in the immediate area of failure). Supplementary support was not provided in these areas. This "failure" was 68 ft long and extended full width of the room. The other two "failures" were approximately 50 ft long and the full width of the rooms. Several factors contributed to them, among which were: (1) incomplete extraction, small blocks of coal were left which probably caused shifting of stresses, thus affecting the roof outby; (2) wet conditions of roof; (3) supplementary support as planned was not provided at the entrance to crosscuts not used for haulage; and, (4) wide intersections.

Originally, the crosscuts were opposite each other across the rooms. To reduce the area where crosscuts were in line, the projections were changed so that they would be staggered. Flexure of roof is greater at wide four-way intersections and staggering of crosscuts should decrease amount of flexure and thus minimize failure.

In all mechanical mining there is a tendency to increase widths of openings where roof bolting is used. Also, where pillar mining is triple-shifted, small blocks of unmined coal are more likely to be left in the gob.

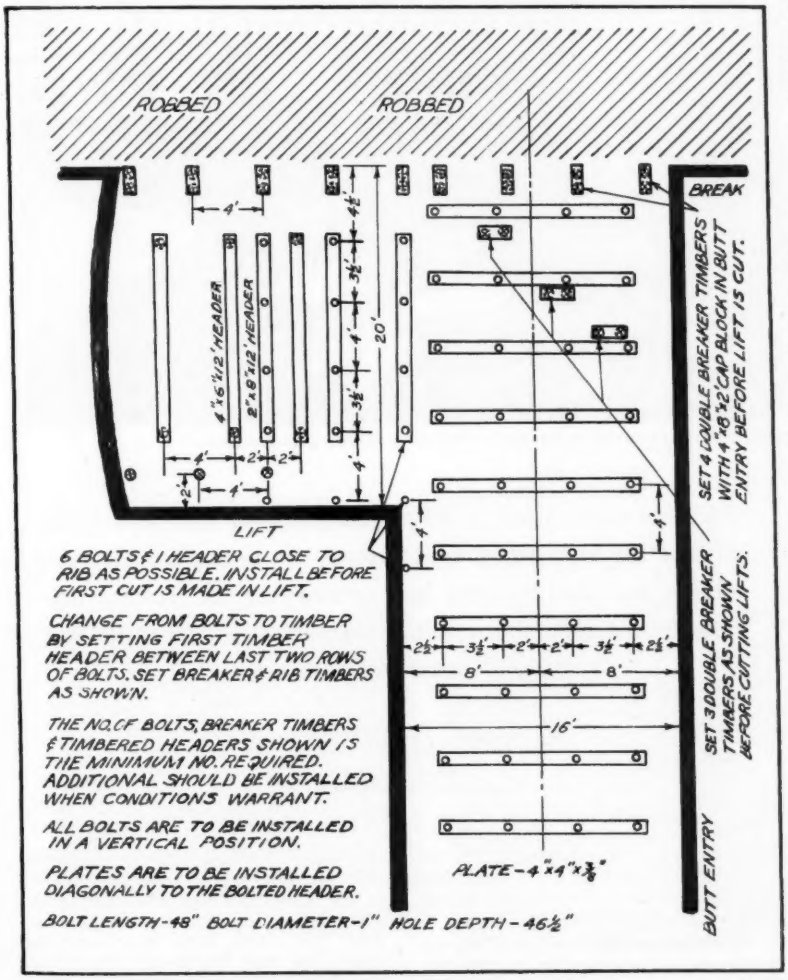


Figure 3. Inadequacy in supporting kettle bottoms brought about the use of timber headers

Advantages Enumerated

Pillaring with roof bolts in this mine has proven advantageous compared to pillaring with conventional timbering. Some of these advantages have been: average daily production increased; delays from roof falls virtually eliminated; cost per ton of coal decreased; faster development and extraction; percentage of recovery increased; number of cars of rock per shift reduced (during the first four months the method was in use, the number of cars of rock loaded was reduced from an average of 6.1 to 0.2 per shift); ventilation improved; haulage facilitated; accidents from roof falls reduced in pillar mining. To date only one lost-time accident that could be attributed to roof support has occurred in these sections.

Observations on Roof Falls

Caving following extraction of coal using bolts for roof support is well controlled, and once the initial fall occurs, successive falls take place more or less frequently. Experience in starting a new pillar line next to solid coal or next to large blocks of coal indicates that the initial fall usually does not occur until after one to three full blocks have been extracted. Thereafter, no particular difficulty was experienced in obtaining successive falls. Initial falls have been observed to take place rapidly, usually en masse, over the entire mined-out area and terminate a short distance inby the breaker posts. In no instance, thus far, have falls extended outby the line and breaker post, into active areas. Once the roof in a mined-out roof-bolted area starts "working," caving soon takes place. Thereafter, falls occur regularly over smaller areas without affecting the roof in active workings. Usually, first indications of the impending falls are slow, progressively increasing tension in the bolts (revealed by bending and cupping of the bearing plates), sloughing or breaking of roof between bolts, and intensified compressing of cap pieces and posts in the area. As flexure of the roof continues posts in the mined-out area start breaking and compressing and heaving of the roof can be heard. *Experience at these mines is that the bolts do not give warning by vibration as has been re-*

(Continued on page 68)

Large Scale Mining of Gravel Deposits in Southern California

Railroad cars and trucks carry away sized aggregate as fast as it comes from the plant

An operating crew of 48 produces 1000 tons per hour at this 202 acre sand and gravel pit, using an electric shovel for loading and belt conveyors for transportation, to supply the rapidly increasing demands for concrete construction material.

By RONALD C. GRIFFIN
Production Manager
Consolidated Rock Products Co.

MACADAM rock was practically the only material used in early days for building roads. The requirements for concrete aggregates kept increasing through the eras of the stick wagons and bottom dump wagons. Then along came the motor truck—first with solid rubber tires and slow speed—then with pneumatic tires and ever increasing speeds.

Builders Had Foresight

It was in the latter part of the solid rubber tire truck era that the Irwindale Plant was planned and finally brought into production in February, 1927.

Credit should be given to the men who laid the plans for this plant. They had imagination and foresight. Instead of following the usual practice of using just a bare minimum of concrete for footings and the balance structure and crushing plant was built with timber. In rebuilding and increasing the production of the plant this timber was torn out and rebuilt with concrete and steel.

The plant as laid out in 1927 was designed for a capacity of 250 tph. The total acreage for this operation was 113. By various purchases and

of the mill built of timber, the Irwindale builders built the main mill bunker and superstructure out of concrete and steel. The concrete in the bin walls has shown some wear over the years, but this has been repaired by guniting.

The original primary screening

coordination of two separate plants with their adjoining acreage, the total available area for the Irwindale Plant is now 372 acres. There are 202 acres in the present pit area. The depth of the pit is 150 feet. The demands on this operation have been increased to the point where it is necessary for the pit to excavate 1000 tph to supply the mill.

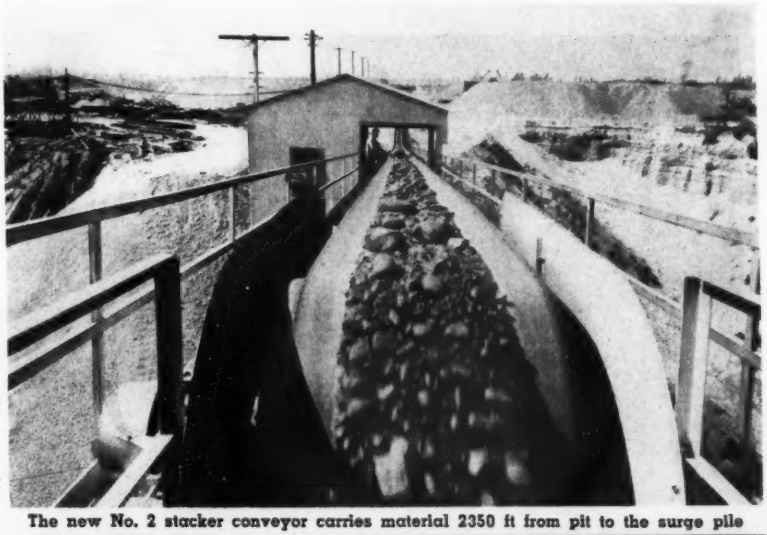
The pit is excavated with a 120B Bucyrus electric shovel with a 6 cu yd bucket. In order to protect the shovel at the bottom of the pit, a Link-Belt 2 cu yd machine with a 60 ft boom pulls a 3000 lb drag up and down the sand and gravel bank to keep it sloped to a safe angle. This operation not only slopes the bank for safety but it also supplies an almost continuous supply of loose material for the 120B shovel to scoop up and put into the hopper. The shovel hopper is located over No. 6 pit conveyor. All of the material is hauled the entire 3800 ft from the shovel to the mill by belt conveyors. A Jeffrey electric vibrating feeder regulates the feed of 1000 tph onto the 42 in. wide No. 6 pit conveyor.

Jaw Crusher in Pit

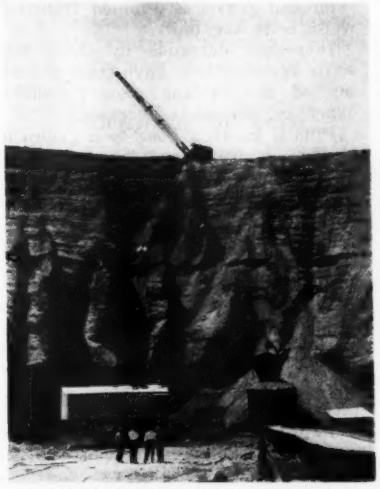
Sand and gravel is conveyed by three conveyors to a permanently located 36 by 48-in. jaw crusher to reduce the large boulders to minus 8 in. These smaller sizes ride satisfactorily on the conveyor belts, and through the junctions without excessive impact and also go through the surge pile without difficulty of plugging.

After going through and past the jaw crusher the material is carried up a 25 percent incline to surface level. At the surface level a transfer or junction box puts the material on the tail end of a 2350 ft single conveyor (No. 2 Pit Conveyor). This

Close-up of the toothed drag which trims the face and keeps shovel supplied with loose material

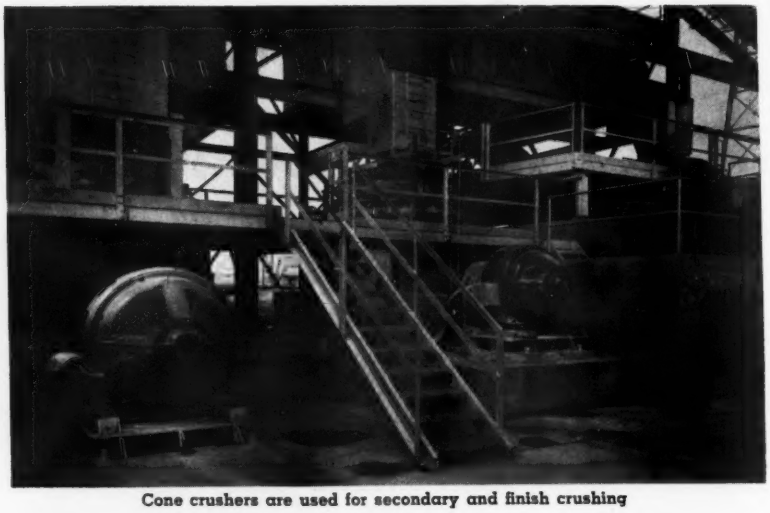


The new No. 2 stacker conveyor carries material 2350 ft from pit to the surge pile



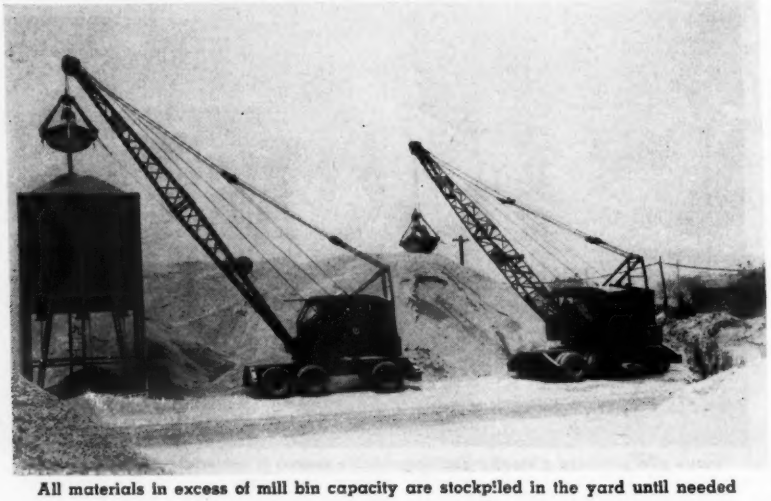
A 3000-lb toothed drag operated from top of the 150-ft face supplies 120-B shovel with loose material

Surge pile provides a steady and dependable source of material to keep mill operating steadily without fluctuations



Cone crushers are used for secondary and finish crushing

A conical scrubber at the top of the 102-ft high screening plant cleans dirty clay covered sand and gravel



All materials in excess of mill bin capacity are stockpiled in the yard until needed

long conveyor runs at 550 fpm, has a 36-in. wide cord belt and delivers the sand and gravel to a surge or raw storage pile. An item of interest in regard to this long 36-in. conveyor may be the extra width of the conveyor stringers to permit extra width for the training of the return belt. Standard return rolls for a 36-in. belt have their bolt hole centers at 45 in., but return rolls with 50 in. center to center, or 5 in. more than standard are used. This extra width is greatly appreciated by the operators and to date after 42 months of operation there have been no mishaps. A number of self aligning, troughing and return rollers help keep the belt centered. The head pulley of the long conveyor is 110 ft above the surge tunnel.

Material is drawn from the surge pile into the tunnel by a Jeffrey electric vibrating feeder delivering onto a 42 in. belt delivering the material to the mill. (No. 1 Pit Conveyor).

At the mill the reclaiming conveyor from the surge pile delivers the material to two 6 by 12 ft W. S. Tyler Type 800 Tyrock mechanical vibrating, or scalping screens. The scalping screens divide the material into sand and gravel to go to one end of the mill. Large rock for the crushers goes to the other end of the mill.

All —3 in. rock is called gravel and all +3 in. material is put through the crushers to make crushed rock.

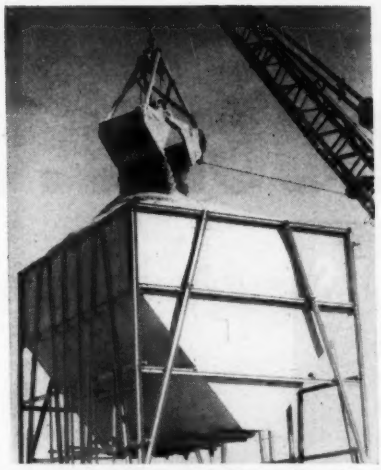
The sand and gravel is conveyed to the top of the mill 102 ft above the ground. There it is scrubbed and then passed along to the Tyrock sizing screens. The sizes of gravel commonly made are: —3 in.+1½ in.; —1½ in.+1 in.; —1 in.+⅜ in.; —⅜ in.+¼ in. Two sizes of sand, concrete sand —¼ in. and plaster sand —⅛ in., go directly into bins below the screens. From these bins trucks and cars can be loaded directly under the bunkers. Water for washing the sand and gravel is pumped from two wells near the mill.

Increased demands by those who write specifications have made screening of the various sizes to rather exact requirements necessary.

Plus 3 in. rock goes to a group of crushers consisting of: one 7 ft standard; one 5½ ft standard; one 5½ ft shorthead; and one 4 ft standard Symons cone crushers.

Crushers all deliver to one 42 in. conveyor belt which takes the crushed rock to a secondary screening plant. At this plant crushed rock sizes can be drawn off to go to the mill for final screening or the larger sizes, not in demand, can be returned through a closed circuit to the crushers for further reduction.

Two conveyors carry the crushed rock to the finishing screens on the mill structure. One carries the +⅜ in. crushed rock to the mill for delivery to Tyrock mechanical vibrating screens. The other carries the —⅜



A number of 75 and 150-ton bins for truck loading in the yard are loaded by clam shells when they are not otherwise engaged

in. material to the finishing screens which in this case are electric hummer screens. The mechanical vibrating screens (Tyrock Type 600— 5 by 12 ft) can make three sizes: No. 1 Rock (—⅜ in.+1½ in.), No. 2 Rock (—1½ in.+1 in.) and No. 3 Rock (—1 in.+⅜ in.) The electric hummers (Hummer Type 38—4 by 10 ft V-50 Vibrators.) make two sizes of material: No. 4 Rock (—⅜ in.+⅛ in.) and rock dust (—⅛).

A special feature of the crushing plant is the location of the crusher lubricating oil pumps and their tanks in a long vault below and to the side of the crushers. This arrangement permits good control over the cleanliness of the lubricating oil as this vault is practically free from dust.

The plant ships about 50 percent of its sales by motor truck and 50 percent by railroad cars. All material is weighed using a 60 ft truck scale for all truck shipments and a railroad track scale for all car shipments.

Stockpiles in Yard

All material in excess of mill bin capacity and not sold is hauled by trucks to the proper area in the yard and there dumped to form its particular stockpile. Often demand for a certain size is much larger than per hour or per day output. In such a case it is necessary to maintain adequate stockpiles at all times to be able to satisfy the peak demands for these particular sizes.

Stockpiling and reclaiming is done by two pneumatic Link-Belt MS90 clams with 50 ft booms mounted on Maxi undercarriages and two Northwest clams on crawler treads.

In the stockpile area are a number of 75 ton and 150 ton bins. These bins can be filled by the clams with the particular size adjacent to the bin. The clam can go to another pile to do reclaming or stockpiling and stay there while a truck pulls under one of the stockpile bins, loads itself without having to wait, and then goes on its way. By the time this stockpile bin of 75 or 150 tons has been drawn empty the clam can find time to return to it and fill the stockpile bin again.

Improve Power Factor

Power delivered to the Irwindale plant by the Southern California Edison Company is at 11,000 v. This is reduced to 480 v for use. About one-half of the power is used at 480 v and the other half stepped up to 4000 v on a four wire, three phase system for distribution to the long conveyors and pit which is over half a mile from the main substation.

Three of the long conveyors are driven by 200 hp, 4000 v motors connected to gear reducers which drive the head pulleys of these conveyors.

Other pit equipment is operated at 480 v power obtained by installing transformers to reduce the voltage from 4000 to 480 v.

The five cu yd Bucyrus electric shovel is supplied with 2300 v. This is obtained from the 4000 v line by the installation of an auto-transformer.

Capacitors are being installed at various locations throughout the plant and pit operation in order to improve power factor and obtain a rebate on the power bill. To date it looks as though the cost of the capacitors will be returned in about five years.

Half of the plant sales are shipped by railroad, the rest by truck

Left to right: Robert Mitchell, president, Consolidated Rock Products Co.; Frank M. Carroll, supt., Irwindale Plant; Ronald C. Griffin, production mgr.; Quentin W. Best, vice-president, CPR Co.

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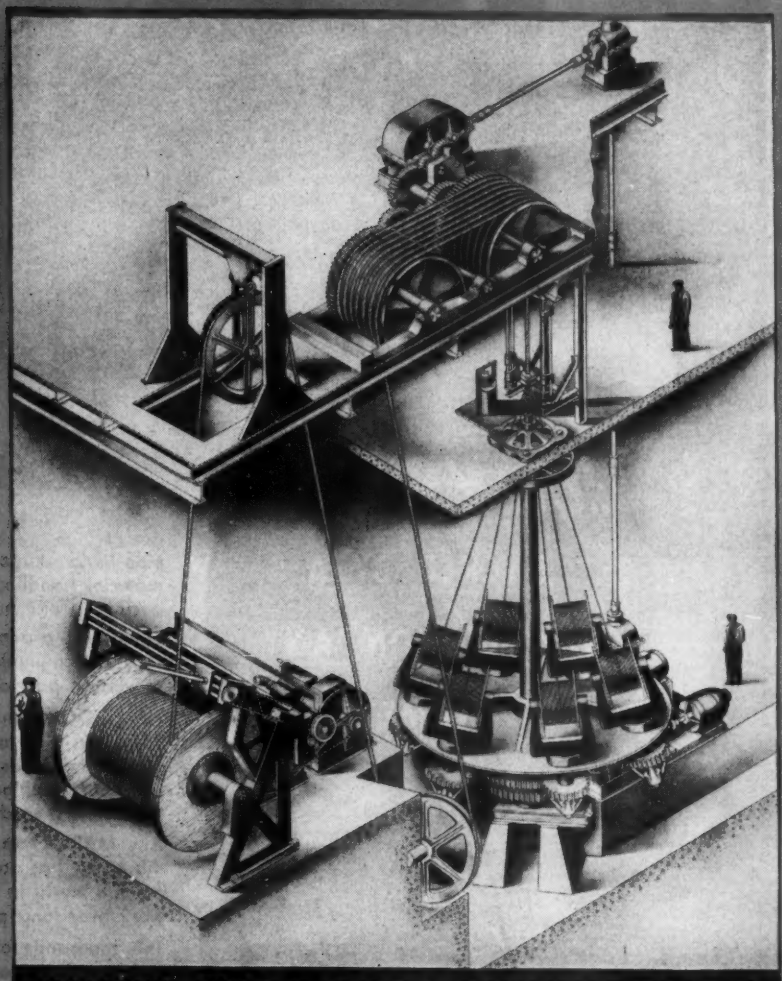

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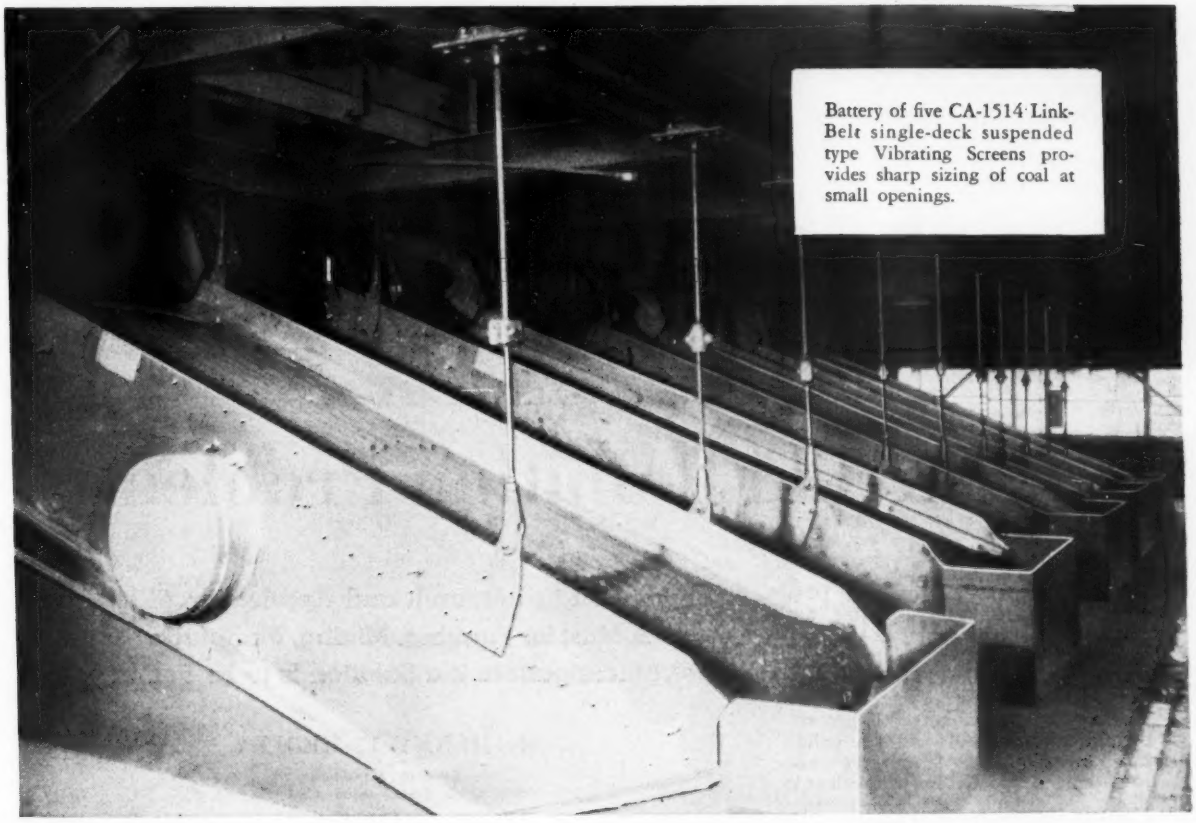

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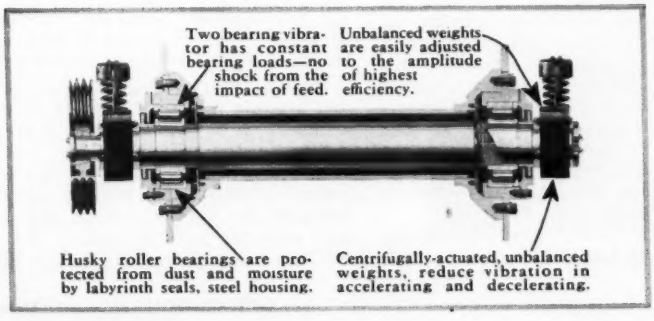

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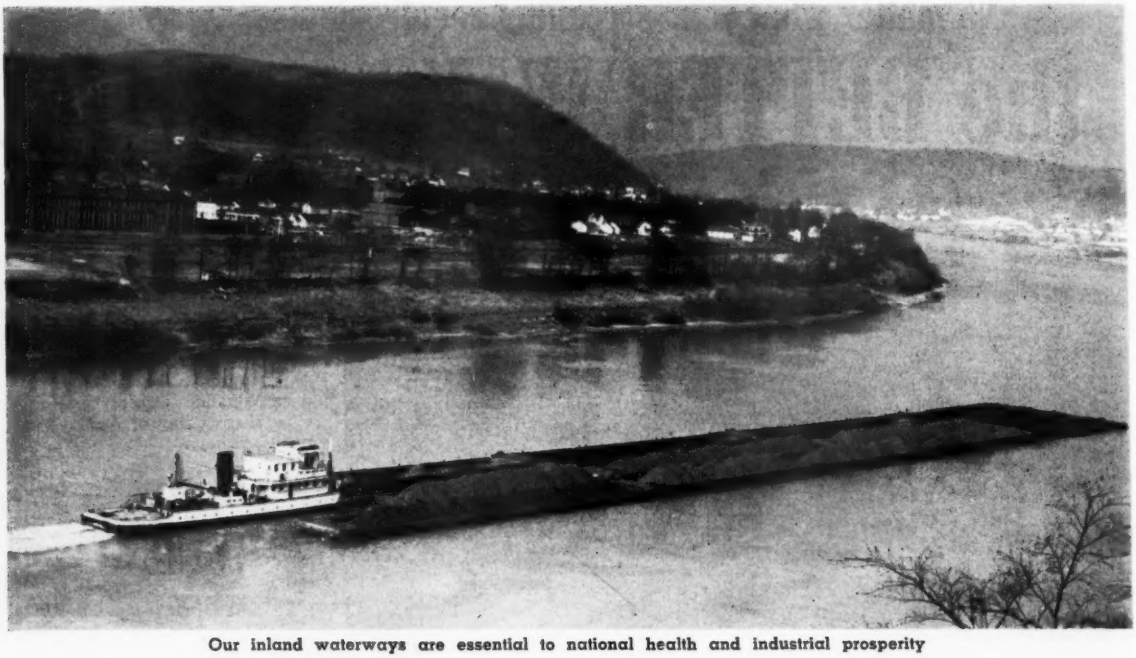


Our inland waterways are essential to national health and industrial prosperity

The Stream-Pollution Problem

Cooperation in Research and Application of Its Findings—A Must for Farming, Mining, Manufacturing and Municipalities if a Solution Is to Be Found

By HENRY F. HEBLEY

Research Consultant
Pittsburgh Consolidation Coal Co.

IT IS little realized that the Ohio River drainage basin contains approximately seven percent of the area of the United States, about 155,000 sq miles, and some 17,600,000 people. In this area, sewage-disposal plants serve approximately 33 percent of the population but, with the pollution contributed by industry expressed in a "population equivalent," there are organic untreated wastes, both domestic and industrial, equivalent to the waste production of 1,200,000 people, which are being discharged to the stream system. In addition, inorganic and toxic wastes from industry are equivalent to 2,500,000 tons of acid per year.

The urban areas in this drainage basin are dependent on surface drainage which forms the rivers for their primary water supply. Also, the rivers must (and, under certain conditions, they could) serve to carry away the waste discharges. To reconcile these two conflicting uses is the task which must be accomplished.

From an engineering viewpoint, domestic sewage disposal poses no problem, as the techniques of municipal sewage disposal are well known. In obtaining the objective of stream purification, it is necessary that municipalities which discharge untreated sewage to the stream system shall build treatment works. This requirement naturally brings up the matter of financing the cost of design, construction, and operation of the plants. Where the municipality does not have sufficient funds on hand, they must be acquired.

Effects of Erosion

Apart from the discharge of human wastes, from urban centers, there is pollution from rural areas. Timber removal and increased agricultural use of the land has destroyed the ground cover so essential to the retardation of run-off after heavy rains and prevention of soil erosion. This form of pollution is present in most of the water-sheds where farming is practiced. The magnitude of this pollution is not recognized by the general public, which accepts the fact that, if there is a flood, the water is bound to be muddy.

However, under flood conditions, the turbidity has been known to reach 6000 parts per million (ppm). This means that 12 lb of topsoil are carried by every 250 gal of water in the swollen stream. Such an economic loss to the agricultural areas is appalling. In addition, there is the detrimental effect on aquatic life, caused by soils pollution, which should be considered.

Except for certain types of bacteria and a few other microscopic organisms, all life needs oxygen, and nearly all life requires sunshine. A lack of oxygen means death, and darkness means a shortened and withered life.

Organic matter consumes oxygen, and organic matter is present in all streams. If it is mixed with mud, it settles to the bottom of the river, covering fish life in the spawn-fingerling stage. The organic matter consumes the oxygen present, and the mud prevents re-oxygenation. As a result, a large percentage of fish life

in its early stages will be destroyed. The fish that survive must still face another hazard, turbid waters. Mud and silt in suspension will clog or cut the gills of many fish and mollusks. Also, the destruction of the worms, algae, insects, and crustacea, on which they depend for food, effectively upsets the life cycle of fish, causing injury or death to these higher forms of marine life.

Erosion Can Be Controlled

By the scientific selection of plant cover to suit soil conditions and thus varying the evaporation and transpiration moisture losses, the amount of water yield may either be increased or decreased. In addition, the yield of ground water can be partially controlled by increasing or decreasing the percentage of surface run-off. This variation in proportion may vary the timber yield in sympathy with the division of the water.

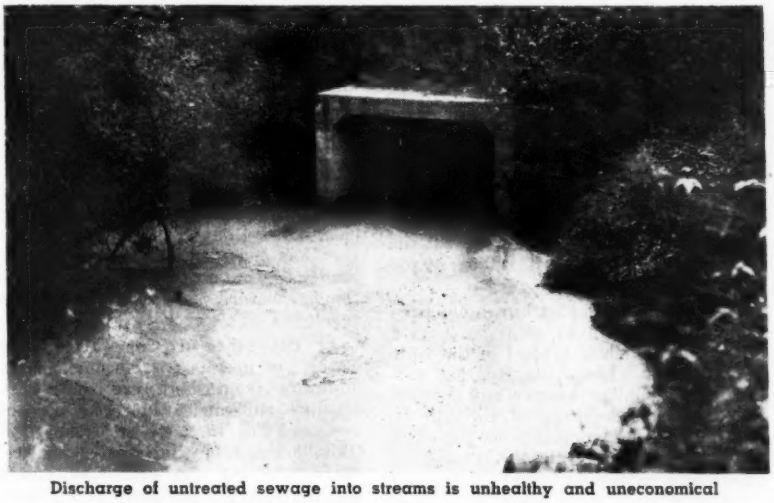
As an example of the influence of vegetative cover on the production of water and its discharge to the stream system, the results of an experiment carried out by the United States Forest Service in North Carolina may be of interest.

"On two small watersheds (33 to 40 acres), the trees, down to broomstick size, were cut to the ground early in 1941. All the cut material was left where it fell, in order not to disturb the litter and humus. Before cutting, sufficient stream flow and climatic records were obtained so that the normal relations between rainfall and run-off could be established. On one watershed, the trees were allowed to sprout up again, as they would following a normal cutting operation. On the other watershed, the sprouts were cut back, each year, so that they never attained any appreciable size. A similar drainage area was left uncut, to serve as a control unit.

This article is an excerpt from a report by Mr. Hebley on stream pollution to the Land Use Committees of the American Mining Congress and the National Coal Association. It is presented as a service to acquaint mining men with the facts of this problem as they apply to the Ohio River Basin.

"The effect of removing the vegetation was spectacular. In the first year of cutting, the total run-off was increased by 65 percent, without any indication that storm flow was augmented, or the quality of the water impaired. The largest augmentation of flow occurred in late summer and fall. On the watershed where the tree sprouts have been kept down, this phenomenon has repeated each year. On the area where the regrowth of vegetation has been permitted, the higher water yields have persisted, although becoming gradually smaller in amount."

In other studies, scarring the surface of the soil or destroying the mantle of litter by farming, roadbuilding, and grazing, was proved, quantitatively, to cause serious deterioration of the soil conditions by erosion, and pronounced sedimentation and discoloration of the stream.



Discharge of untreated sewage into streams is unhealthy and uneconomical

Water-Borne Industrial Wastes

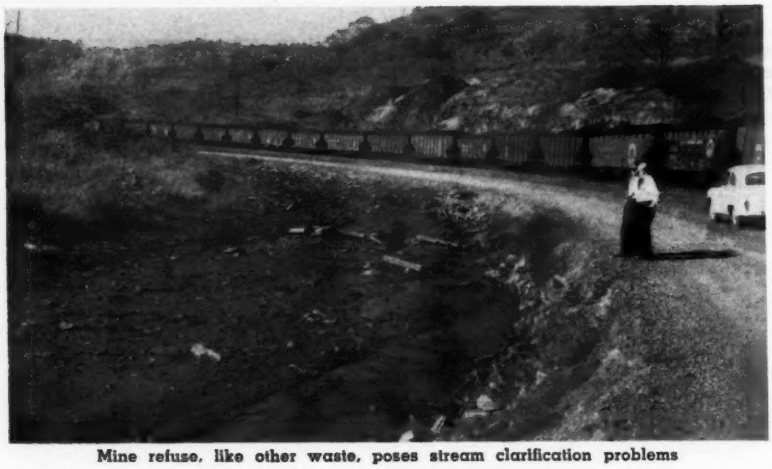
Water-borne industrial wastes within the Ohio River Drainage Basin are derived from practically every type of industrial activity. The changing techniques in the various industrial and chemical processes which have developed in recent years have created new uses for very large volumes of water. Heavy use of water for cooling purposes alone has resulted in relatively high water temperatures in the large centers of population where the stream system is heavily polluted. The Mahoning River, flowing through Youngstown, Ohio, is probably an extreme instance. Water employed by the steel industry there, for cooling, is used as many as 10 times and, on occasion, this has raised the temperature of the river to 140° F.

The use of ground water for comfort air conditioning in Pittsburgh has also made heavy demands. Excluding those installations employing artificial refrigerants, rather than well water, and the larger systems recirculating municipal water through cooling towers, the volume of ground water pumped has steadily increased.

This increase for air conditioning alone, in Pittsburgh, is shown by the

—Soil Conservation Service, U. S. Dept. of Agriculture

Soil erosion is one large source of stream contamination



Mine refuse, like other waste, poses stream clarification problems

following figures, presenting the daily average pumpage:

Year	Million Gal. Per Day	Million Gal. Per Year
1930.....	0.12	15.0
1940.....	2.08	222.7
1950.....	4.47	491.7

Foregoing figures present the average daily pumpage. However, the use of air conditioning, and the demand for ground water, vary with the seasons. In general, air conditioning commences in April or May and ends in October. The peak demand is usually in July. This is particularly true in the Triangle area of Pittsburgh, where the air-conditioning pumping load, in 1950, was approximately 25 percent of all the pumpage during the year. Considered on a maximum daily-rate basis, this air-conditioning use runs nearly equal to all other uses. These facts stress the phenomenal increase in water demand for one particular use alone. Others are in proportion, and such demands cannot be increased indefinitely, as the replenishment of the waters in the aquifers supplying the wells will be inadequate to keep pace with the pumping load.

The aquifer underlying the Triangle in Pittsburgh receives inflow from both the Allegheny and Monongahela Rivers and, while both these rivers are polluted, the filtering effect of the sand and gravel which forms the water-bearing strata tends to purify the water supply. The water inflow is quite limited, however, both by natural geologic barriers and man-made obstacles. In the latter case, the steel sheet piling used in the construction of the river-embankment structures along the Allegheny River has cut the cross-sectional area of inflow by 50 percent.

The situation in Pittsburgh has been cited at some length, as it portrays a condition which is typical in the Ohio River Basin. Louisville, Ky., has suffered in a similar manner, and matters became critical during World War II, due to the heavy demands on the wells for water used in the processing of synthetic rubber. In fact, it may be said that the industrial requirements, most of which is used for cooling water, exceed the quantities used for domestic purposes.

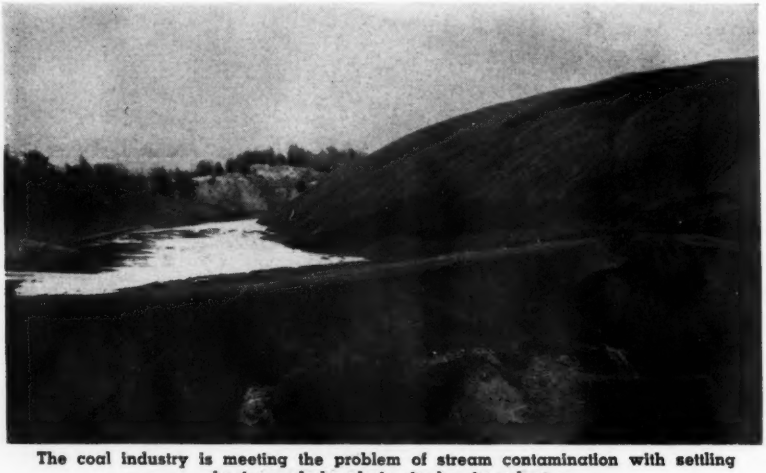
Apart from the employment of water for cooling purposes, one of the principal uses made of the streams in the Ohio River Basin is the transport of trade wastes. This industrial-waste pollution problem has increased continuously over the past century, and the rate at which the situation has become critical roughly parallels industrial growth and corresponding increases in population.

Remedies Sought

Some of the industries, now fully aware of the problem, are taking steps to alleviate the conditions caused by the water-borne industrial trade wastes. For instance, a chemical plant located on the Kanawha River, in the vicinity of Charleston, W. Va., has improved its processes to increase re-use of waste water. Cannery wastes in the Wabash River Basin are now lagooned, to be released during non-critical stream-flow periods. Modern coal-cleaning and preparation plants have installed elaborate sedimentation and clarification plants for the removal of suspended solids from washery effluent before discharge to the stream system. On the other hand, the treatment of acid water discharged from coal mines still presents a formidable problem. Much research work has been carried out but, as yet, no solution has been found. Progress has been made, but a great deal of research remains before a successful method is developed.

At the other extreme from acid water, yet just as troublesome, is the pollution from discharge of highly alkaline substances into the stream system. For instance, at Coshocton, Ohio, brine industrial wastes is seriously affecting the municipal water supply; and at Marietta, Ohio, likewise, brine is polluting the aquifers feeding the wells which furnish the municipal water supply.

It is evident, therefore, that the Ohio River Drainage Basin requires close study with respect to the control of the quality and quantity of water flow, if the industrial and municipal growth of the area is to continue. Even now, some of the new industries being founded there require a raw water supply of better quality than necessary for domestic use. Where stream pollution is heavy, the cost of treating the large quantities of water used in some manufacturing processes may impose serious economic obstacles to such industries. These may be the factors which cause such industries to seek other locations outside the river water shed. This is the situation in the Ohio River Drainage Basin.



The coal industry is meeting the problem of stream contamination with settling basins and closed circuit cleaning plants

Concentrates produced from brown iron ores are loaded for shipment to Birmingham, Ala. steel mills

Heavy-Media Separation of Northern Alabama Iron Ores

Treatment of Brown Iron Ores Key to Lower Production Cost and New Life for District

By J. B. BAKER
Manager
Schroeder Co.

NORTHERN Alabama mineral production consists chiefly of the brown ore (limonites) industries centered around Russellville, in Franklin County, located about 120 miles northwest of Birmingham. It is pertinent to emphasize that brown ores produced in the Russellville district are considerably different from the more publicized and well-known "red iron ores" (hematites) of the Birmingham District. Although production from both localities supplies the blast furnace operations centered in Birmingham, each district has its own peculiar economic and metallurgical problems which must be reckoned with by mining and mineral processing engineers.

Alabama iron production dates back to 1815, when the first blast furnace was installed near Russellville to treat the brown iron ores. Early mining was confined to excavation of outcrops and deposits with the shallowest of overburden. Crude selective mining and hand sorting methods sufficed to meet production requirements of those days. As time passed, Birmingham ore production and furnace operations came into existence, and competition entered the picture. The up-grading methods of earlier days were replaced by more vigorous hand-picking methods, log washing and various means of gravity beneficiation, including jigging. Despite these efforts, the district faced keen economic competition and production was only sporadic. Then, about 1940, with most of the shallow deposit reserves worked out, a movement began toward the operation of gravel bearing deposits several miles west of Russellville. The following decade saw a rebirth of brown iron ore production. Great strides were made in all phases of mining and processing. Dinkeys and track haulage equipment were replaced, first by small gas powered dump trucks and then by larger, more efficient, 15-ton diesel powered trucks. Bull gangs of 15 to 20 men were replaced by bulldozers operated by one man. Steam shovels were replaced by diesel shovels and then by draglines in open cut operations. Washing plant flowsheets were greatly changed with hand-picking and jigging being replaced by Heavy-Media separation. Revolving screens have been replaced with efficient vibrating screens.

Hand sorting and jigging as applied to the original surface and shallow deposits sufficed in the former days of lower operating costs. However, the depletion of these reserves, with resultant operation of the gravel bearing ores soon showed that these methods were not practical. It was in 1943 and 1944 that operators began investigating possible application of Heavy-Media processing of the brown iron ores in conjunction with the Stamford Laboratories of the American Cyanamid Co. This work was culminated in 1945 with assignment of a contract to Western-Knapp Engineering Co. of San Francisco for the design and installation of the district's first Heavy-Media plant. The new unit has been in continuous successful operation ever since.

Today, three producing companies are operating four Heavy-Media plants in the Russellville area. Their aggregate annual production is over 1,000,000 tons of furnace grade ore. These operators use the same general system of mining, hauling, sizing and washing, with further beneficiation by Heavy-Media processing. Present indications are that several more plants will be installed, and that this area will take a relatively small, but nevertheless important position, in iron ore production of our nation.

The following table gives estimated annual statistics on production of northern Alabama brown iron ores, based on present facilities.

Mining and Development

Lower Cretaceous in age, the deposits overlie the flat Bangor limestones. They are residual in nature being characteristically different in uniformity, and underlie overburden material that varies in depth from 0 to 75 ft. Ore zones average 15 ft in thickness. The iron mineral is limonite and related minerals, and occurs in varying sizes as fragments in sand and gravel matrixes.

Careful engineering design and assembly of prefabricated units contribute to the low cost production of iron concentrates

The rather limited known ore reserves in the district necessitate continuous search for location of new ore and reserve deposits. Exploration is performed with 6-in. churn drills. Holes are spaced on 100-ft centers, with check holes placed as the occasion may require. Drilling operations can precede mining by several years. The work generally under way at present is aimed at gradual extension and location of known reserves.

Mining operators generally employ boom type draglines for both stripping and mining operations with an average ratio of strip tonnage to ore mined of approximately 3:1. The draglines carry 2 to 5 cu yd buckets and 60 to 120 ft booms. The larger machines are used in stripping operations. The smaller bucket and shorter boom units do the ore-loading. Bulldozers are used to aid in mining and to facilitate general surface operations. Broken ore is transported to the treatment plant site by rear dump trucks over well kept roads that are surfaced with waste gravel from the washing plant.

Ore Treatment Uniform

In the treatment of Russellville brown iron ores, milling practices generally follow the same pattern at all plants. For this reason, it will be simpler to discuss the flowsheet of one plant, bearing in mind that modifications are made to suit individual requirements at each plant. One of the newest and most modern installations is discussed in detail below.

Screening, crushing and washing operations produce a waste mud, an intermediate size fraction of suitable market grade, and a coarse fraction, for Heavy-Media feed. The latter receives further screening for more effective removal of fines, with oversize material passing to a prefabricated Heavy-Media plant. Dewatered and deslimed fines are combined with Heavy-Media concentrates, the total production being stockpiled for shipment.

Raw ore from the pit is stockpiled at the washing plant and bulldozed, as required, into a 30 by 30-ft hopper. At times the ore trucked from the mine is dumped directly into the hopper. A manually operated hydraulic gun with 1⅛-in. diameter nozzle, operating under 60 psi pressure is used to wash ore from the bin to a 4 by 12-ft single deck scalping screen having 2½-in. cloth openings. Screen oversize is passed through a 24 by 36-in. single roll crusher set at 3 in. and is then combined with screen undersize to feed a 12-in. by 25-ft duplex log washer set on a 1½-in. slope. Slime overflow is pumped to a mud pond. Log washer sands are passed over a triple deck vibrating screen. Minus 1/32-in. material from the bottom deck is either pumped to the mud pond or combined with other screen sizes, depending upon the grade. Minus ¼-in. plus 1/32-in. material from the middle deck is conveyed directly to the concentrate stockpiles. This will assay 42-45 percent Fe and is blended with Heavy-Media concentrates as a shipping product. The 3 by ¼-in. ore from the top deck of the screen is conveyed to a Heavy-Media feed stockpile.

Table II indicates approximate distribution in the sizing and washing circuits.

Heavy-Media Separation

The 3 by ¼-in. raw feed is drawn from the Heavy-Media stockpile by tunnel conveyors which discharge on two 5-ft by 16-in. double deck vibrating screens operating in parallel wet circuits. Minus ⅛-in. material is passed from the screens as an undersize product and flows by gravity to a 48-in. diameter dewatering spiral classifier. Spiral overflow is pumped to the mud pond. Spiral sands are conveyed to the concentrate stockpile along with the Heavy-Media concentrates. Oversize from both decks of the vibrating screens is combined and conveyed direct to the feed chute of the Heavy-Media separator.

Ferrosilicon is used as the separat-

Erection of Heavy Media separation plants has meant the difference between shut down and profitable operation in northern Alabama

TABLE I
ANNUAL PRODUCTION ALABAMA BROWN IRON ORES

Total Tons Mined Pit Ore	Tons Overburden Removed	Estimated Annual Tonnage & Direct Shipment from Washer	Heavy-Media Concentrate	Total Ore
4,500,000	6,000,000	500,000	1,000,000	1,500,000

TABLE II
DISTRIBUTION OF SIZING

Tons per Hour	Washer Feed	100 percent
Scalping Screen	Oversize	10 percent
Scalping Screen	Undersize	90 percent
Log Washer Product		85 percent
Slime Overflow		15 percent
Triple Deck Screen:		
—1/32 in. to waste		3 percent
—¼ in.x1/32 in.		28 percent
—3 in.x¼ in.		69 percent

TABLE III
DRUM SEPARATOR RESULTS

Product	% Wgt.	Assays % Fe	Assays % Insol. & Other Minerals
Drum Feed	100.0	32.9	67.1
Drum Conc.	63.8	47.0	53.0
Drum Tails	36.2	8.0	99.4

ing medium. The feed chute to the drum separator has a submerged outlet to direct feed in a path parallel to the axis of drum rotation. Hence the currents caused from feed entry are minimized. Mention of this factor is given to point out that every possible effort is made to operate under true "sinkfloat" conditions, which preclude the use of currents to effect the separation. The separating medium is maintained closely at 2.90 sp gr with differential from top to bottom of the pool varying from 2.85 to 2.95, respectively. The drum is fabricated with 32 lifters attached to the inside periphery of the shell, and spaced on approximately 8-in. centers, for elevation and discharge of the sink product. The lifters are 6 in. deep with the outer 3 in. perforated with ½-in. holes spaced on 2-in. centers. The drum was furnished with a variable speed drive for rotation of ¾ to 1½ rpm, allowing for a consistent balance between sink discharge capacity and sufficient pool agitation to maintain proper medium suspension. The drive was later changed to a conventional type after the most effective drum speed was found to be 2.4 rpm. The lifters discharge the sink load to a chute located well above the pool, and passing on a slope through the discharge end of the drum. The chute conveys the sink concentrate to the medium drainage screens. Small quantities of circulating medium are used as required to aid material flow through the chute.

The float product is segregated from the entrapment by rising lifters by use of partition plates extending the length of the pool. Float material is overflowed by volume replacement over a circular weir at the discharge end of the drum. The overflow product passes by chute to the medium drainage screens.

Typical metallurgy is summarized in table III above.

Sink and float products discharged from the drum separator carry some of the medium. The balance of the Heavy-Media flowsheet involves the reclamation, cleaning, and re-circulation of this medium.

The drum separator products flow onto two 5 by 12-ft medium drainage-washing screens operating in series. The screens are longitudinally partitioned in order that sink concentrates may pass along one side of the screens while the float tailings pass along the other side. Screen operation consists of medium drainage as the sink and float products are traveling over the first 8-ft length of travel; this action is followed by a product washing operation to free the remaining adhering medium during the last 16 ft of travel. The screen is equipped with 10-mesh stainless steel cloths. Some 70-90 percent of the ferrosilicon medium drains through the screen during the first 8 ft of travel. The balance of the medium is washed through the screen during the remaining screen retention time by use of 50 ramp bottom type sprays mounted over the screens. This operation is carefully observed by shift operators since, at best, the sink product tends to be porous in nature. It is necessary that screen action continually turn the particles so that spray hits all surfaces. Due to the porous nature of the material, medium losses are slightly higher than normally encountered in Heavy-Media practice. However, careful observation and operation of the washing section on the medium screens holds losses to a minimum.

Medium draining through the screens passes into separate drainage and washing sumps. The free draining, undiluted medium is pumped directly back to the drum separator by a 4-in. circulating pump. The diluted medium passes to the reclamation circuit.

Medium from the wash hoppers passes by gravity through a 6-in. magnetizing block into a 16-ft diameter by 6 ft deep heavy duty medium thickener. The magnetic blocks flocculate the fine ferrosilicon, making for accelerated settling conditions in the thickener. Thickener overflow is fed to a 3-in. water pump having a discharge line directly connected to the medium screen spray system. Thickener underflow is pumped by a 2-in. sand pump to a 36-in. primary magnetic separator.

The primary magetic separator is operated in series with a 24-in. secondary unit. Tailings from the secondary unit pass by gravity to the 48-in. classifier. The magnetically cleaned ferrosilicon from both units passes by gravity to a 36-in. diameter densifier. Recovery of magnetic solids passing through the primary and secondary magnetic separator circuits is quite high.

Stored and Re-used Medium

Cleaned and partially dewatered ferrosilicon from the magnetic separators is further dewatered in the densifier. The latter unit, operating at 3½-in. per ft slope, has a spiral speed of 1.4 rpm. The densifier serves as a storage reservoir from which cleaned medium is returned to the drum separator, as required. Rate of medium return is controlled by operation of a motorized lifting device furnished for raising or lowering the spiral. Densifier overflow passes by gravity to the medium thickener. Dewatered medium discharged from the densifier passes by gravity through a 6-in. demagnetizing coil into the 4-in. medium circulating pump sump. The demagnetizing action is essential for deflocculation of the magnetized medium and makes for proper viscosity and accurate gravity control in the drum pool.

A 65 mesh grade of ferrosilicon, analyzing 85 percent Fe and 15 percent SiO_2, is purchased in carload lots. New ferrosilicon contains small amounts of graphite and makeup medium is added to the densifier to wash out the carbon and to thoroughly wet the medium prior to entry into the separating circuit. Ferrosilicon consumption runs just under 1 lb per ton of drum feed. The following screen analysis is representative of the size gradation of the medium:

Mesh	% Wgt.
65	5.5
100	14.2
150	13.1
200	13.6
200	53.6

The float tailing discharged from the medium screen passes by chute to a 20-in. belt conveyor. The conveyor discharges into 8 by 10-ft steel waste storage bins arranged for waste disposal by truck. This waste is used for road surfacing in and about the property.

Sink concentrates from the medium screen are passed over a weightometer on to a 24-in. conveyor belt; the conveyor discharges to concentrate stockpiles. Sands from the dewatering spiral in the feed preparation circuit are combined with the sink concentrates on the same conveyor. Concentrates are drawn from the stockpile by a tunnel conveyor and are loaded into hopper and gondola type railroad cars for shipment to Birmingham mills via the Southern Railroad.

* * *

Other Heavy-Media plants in the Russellville area generally follow flowsheet practices similar to those discussed above. Principal differences are in plant design and type of separatory vessel in usage. Two plants in operation employ cone type separators and the remaining two plants use the drum type of separator.

It may be of interest to point out the differences found in operation of drum and cone type of separators used in the Russellville area. To date, metallurgical results are just slightly in favor of the cone, despite the fact that the drum separators receive a dirtier feed. It so happens that drum feeds are contaminated with a greater clay content, some of which is not completely removed in the feed preparation circuit. At the present time work is under way to overcome this factor, and the chances are even that in future operation the drum will at least equal metallurgical results of the cone. However, since the feed is contaminated at the present time, it is interesting to point out that the cone separator is less sensitive to a dirty feed. This is readily understood when realizing that the pool volume of a cone is generally considerably greater than that of a drum. Hence the difference in the ability of the two separators to absorb changing conditions such as dirty feed is a factor of the difference in pool volumes. The larger the volume, the lesser the degree of sensitivity, since there is a greater opportunity for the medium to absorb feed variation characteristics. This in no way reflects on either type of separator and is merely pointed out as an operational factor to be contended with except under ideal operating conditions.

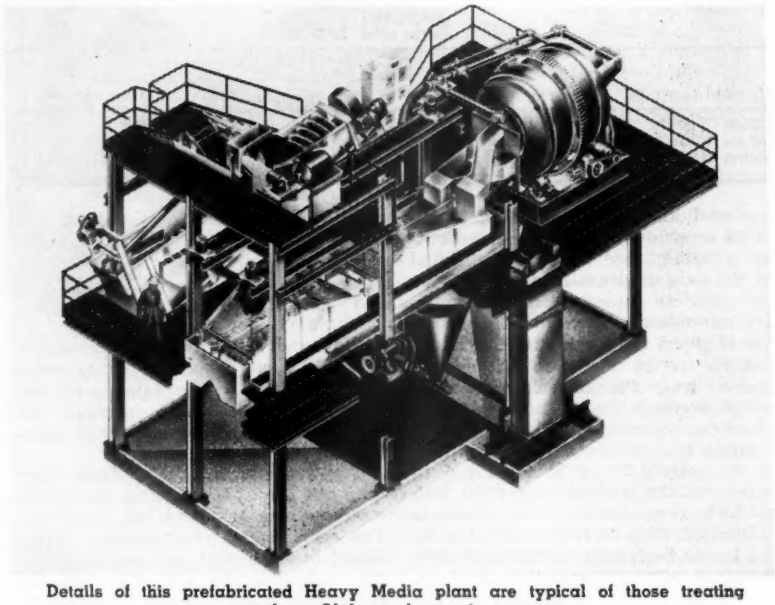
The drum type of separator definitely has the edge over the cone when considering the ease of operation. Operational attendance time is greatly decreased. Maintenance costs are about equal. Power is decreased by elimination of requisite air lift compressor power used in cone operation. More positive removal of products from the drum allows greater percentage of operating time. Overall unit operating costs are somewhat lower. All in all, the drum is a decided improvement for this type of operation, from a mechanical viewpoint.

Check Specific Gravity

It is, of course, essential to maintain a steady separating gravity in either the drum or cone. To accomplish this, gravity readings are taken every 30 minutes. Adjustments in medium gravities are made as required by adjustment of valves in the circulating medium and water lines. Control is also gained by operation of the densifier. An additional control is effected by adjustment of a butterfly type of separator mounted under the medium drainage screens but above the medium hoppers; this allows considerable adjustment on the volume of medium return directly to the separating circuit and that volume passed to the medium cleaning and reclamation circuit. Shift operators are thoroughly trained and quickly learn the flexibility of the various operating adjustments and in a remarkably short time can produce steady and consistent results.

Costs of operating the Heavy-Media sections of Russellville District washing circuits, based on a feed rate of 80 to 120 tph, vary from 35 to 45 cents per ton of concentrate produced. Costs include two men per shift for operating the Heavy-Media section, all maintenance and operating materials, power and overhead. These figures are general and are given as estimates for information purposes only.

There is a more important story involved in the operating costs of the Heavy-Media plants. Under today's technological and economic operating conditions, Heavy-Media accomplishes the purpose necessary to the survival of the district—an accomplishment that is not feasible with other concentration processes. In addition, the adaptation of Heavy-Media to treatment of brown iron ores made possible a new conception of operating economics in the district. The high costs of selective mining were considerably reduced. It became far cheaper to put gravel bearing ore through Heavy-Media, than to mine selectively. In turn, mining costs were reduced per ton of output. Increased mine output, although lower in grade, contained far greater iron content. Hence mine costs per ton of iron produced were decreased. The efficiency of the Heavy-Media plants gave better iron recovery per ton of pit materials produced. In this respect, it can be pointed out that at least one Heavy-Media installation actually replaced an expensive picking belt operation that involved the labor of 16 operators. The net gain has been a 33⅓ percent increase in output at lower costs.



Details of this prefabricated Heavy Media plant are typical of those treating northern Alabama brown iron ores

Acknowledgment

The contribution of information and the kind cooperation of several Russellville District operators have made possible the presentation of this paper. Grateful acknowledgment for permission to present this paper is given to Mr. E. C. Schroeder of Schroeder Co.

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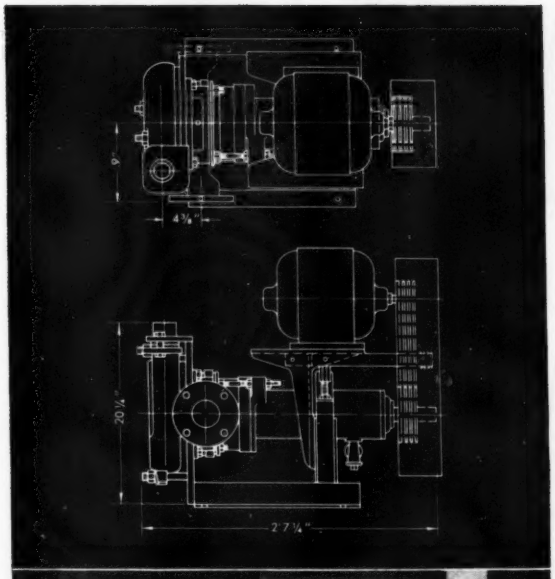

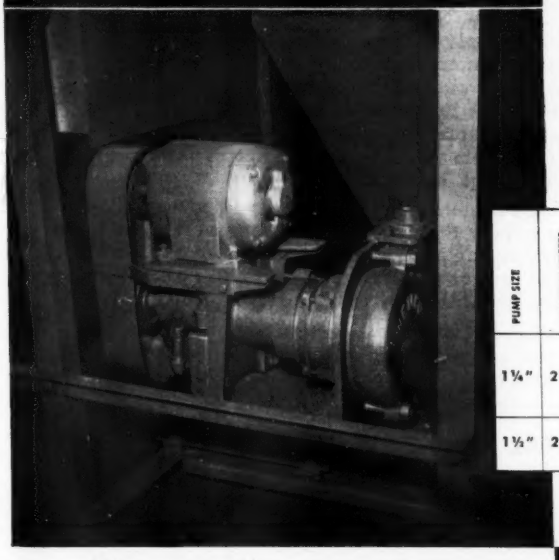

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							20'		30'		40'		50'		60'	
							RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
1¼"	2½"	1¼"	9"	¼"	2'-4'	20	1055	.7	1280	1.4	1475	1.9	1650	2.6		
						40	1080	.8	1300	1.7	1495	2.0	1665	2.7		
						60	1115	1.0	1330	2.0	1520	2.2	1690	2.8		
1½"	2½"	1½"	9"	¼"	2'-4'	80	1090	1.4	1300	2.1	1500	3.3	1675	4.8	1825	6.2
						100	1120	1.6	1320	2.3	1520	3.4	1690	5.0	1840	6.4

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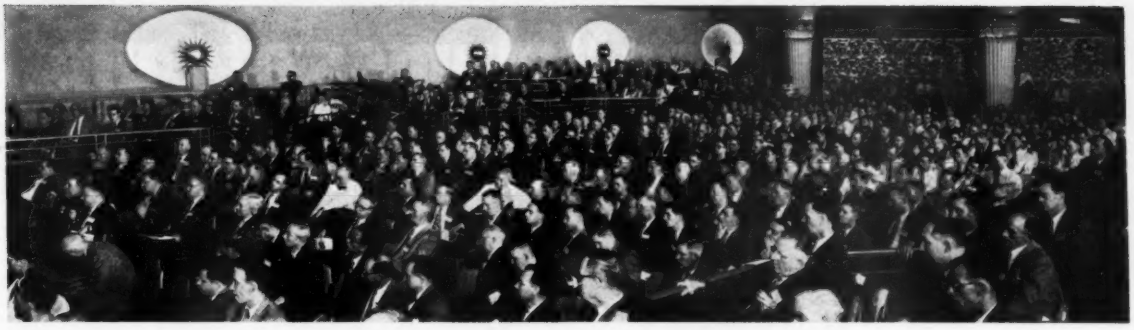

Cincinnati Host to 1952 Coal Convention

General Plans Under Way as Topics of Maximum Interest are Chosen

THE 1952 Coal Convention of the American Mining Congress' will be held at the Netherland Plaza Hotel, Cincinnati, May 5-7. This three-day meeting will be of special importance to the coal industry, coming at a time when questions of national security demand full attention. Plans for the meeting are already well underway. The Program Committee, a group of industry leaders representing both operators and manufacturers, has been organized under the chairmanship of Kenneth A. Spencer. This group met in Pittsburgh on November 14 and completed general plans for the three-day meeting. Subjects of maximum importance to the industry were selected for papers and speakers of recognized authority will be invited to present them. Further announcements will be made as the Convention program matures.

In addition to the regular sessions, there will be a luncheon meeting on one, or perhaps two, of the days with addresses by speakers of national renown. Questions directly relating to coal's position in our national economy, the procurement of materials and supplies to insure adequate coal production, and operating problems will be thoroughly discussed at the sessions and luncheon meetings. Following accepted tradition, the Convention will close with the Annual Banquet on Wednesday night—speechless but with plenty of entertainment.

Room accommodations should be made directly with the hotels in Cincinnati. Requests have been pouring in and all those planning to attend are urgently advised to make their reservation applications immediately.

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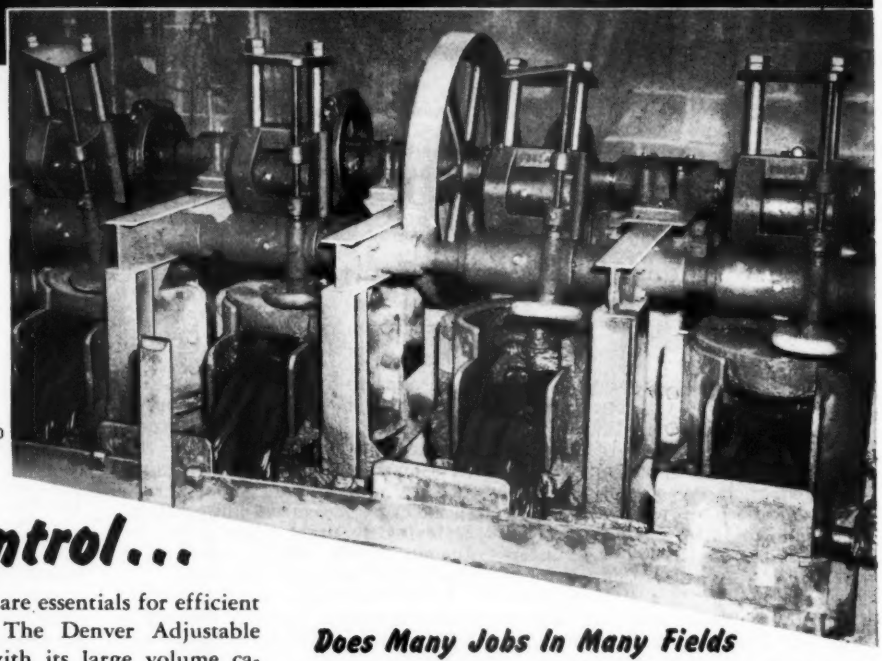

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Gallons pulp per min.... 600
Tons solids per 24 hrs.... 1450-2000

Density Control...

... and pulp flow regulation are essentials for efficient industrial plant operation. The Denver Adjustable Stroke Diaphragm Pump, with its large volume capacity, ease of control, and rugged, long wearing construction, is an ideal unit for heavy duty "24-hour service."

Hand Wheel Controls Pulp While Pump is Running

Simply turning the adjustable hand wheel changes the length of stroke and immediately alters the pulp flow to the required amount, *while the pump is operating.*

Rugged Construction Gives Long Life And "24-Hour Service"

The Denver Adjustable Stroke Diaphragm Pump is sturdily built to give trouble-free service. Molded rubber valve seats and diaphragms are long wearing and may be quickly replaced with a minimum of shutdown time.

Does Many Jobs In Many Fields

In coal washing... in copper, phosphate, potash and other concentrators... and in industrial plants... large volumes of pulp are being handled "24 hours per day," month after month with these heavy duty Denver pumps.

Wide Range of Sizes, Large or Small Capacities

Sizes range from 2" to 6" in Simplex, Duplex, Triplex or Quadruplex units.

A 6" Quadruplex Pump, handling 60% solids at 4.2 specific gravity, has a rated capacity of 3,140 tons per 24 hours. A 2" Simplex Pump under similar conditions has a rated capacity of 80 tons per 24 hours.

Size	Type	RPM Normal Speed	Stroke Range Inches	Capacity Cu. Ft. Per Min. Solution	Capacity Tons Pulp Per 24 Hours 50 Per Cent Solids 1.5 Sp. Gr.	2.6 Sp. Gr.	3.5 Sp. Gr.	Motors H.P.
2"	Simplex	40	½–1⅝	2.42	53	65	72	¾–1
2"	Duplex	40	½–1⅝	4.84	106	130	144	1½–2
2"	Triplex	40	½–1⅝	7.26	159	195	216	2–3
2"	Quadruplex	40	½–1⅝	9.68	212	260	288	3–5
3"	Simplex	40	⅝–2⅜	4.69	102	125	139	1½–2
3"	Duplex	40	⅝–2⅜	9.38	204	250	278	2–3
3"	Triplex	40	⅝–2⅜	14.07	306	375	417	3–5
3"	Quadruplex	40	⅝–2⅜	18.76	408	500	556	5–7½
4"	Simplex	40	⅝–2⅜	5.98	124	153	169	1½–2
4"	Duplex	40	⅝–2⅜	11.96	248	306	338	2–3
4"	Triplex	40	⅝–2⅜	17.94	372	459	507	3–5
4"	Quadruplex	40	⅝–2⅜	23.92	496	612	675	5–7½
5"	Simplex	40	1½–3	18.0	400	470	500	2–3
5"	Duplex	40	1½–3	36.0	800	940	1000	5–7½
5"	Triplex	40	1½–3	54.0	1200	1410	1500	7½–10
5"	Quadruplex	40	1½–3	72.0	1600	1880	2000	10–15
6"	Simplex	40	2–4	23.0	525	625	665	3–5
6"	Duplex	40	2–4	46.0	1050	1250	1330	5–7½
6"	Triplex	40	2–4	69.0	1575	1875	1995	10–15
6"	Quadruplex	40	2–4	92.0	2100	2500	2660	15–20

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With the Defense Agencies

SPEAKING before the Western Division of the American Mining Congress at Los Angeles in late October, DMPA Administrator Jess Larson declared that it appears that well over one-half of the 90 minerals and metals with which his agency is concerned "may be in short supply in the near future at least, if current military and civilian requirements are a gauge."

Larson told the Mining Congress that even after three years of development, on the basis of all assistance programs now approved, serious and critical differences will exist between presently projected requirements and the estimated yield. He said this is particularly true of such vital metals and minerals as columbite, tungsten, copper, manganese, industrial diamonds, lead and "many others." He stated that the percentages of deficiency range from more than 75 percent to no less than 8 percent.

To meet this situation, the DMPA Administrator said that his agency: (1) has already begun an intensive study which "will give us the best possible picture of requirements, existing sources of supply and potential supply," (2) on the basis of the findings of this study, will launch "an aggressive program, using all the methods we are authorized to employ, to expand domestic sources of supply, emphasizing the development of new resources through exploration," and (3) stimulate additional production of needed minerals and metals abroad when domestic production cannot satisfy requirements.

Meanwhile, contracts providing Government assistance for 18 exploration projects for strategic and critical metals and minerals in nine States were signed and approved by the Defense Minerals Administration during the first half of October.

The contracts involved 8 scarce commodities—lead, zinc, copper, antimony, mica, asbestos, beryl, and tungsten. The over-all cost will be $373,624, of which the Government's participation will be $230,983, or 61.82 percent. The projects are in Idaho, North Carolina, Wisconsin, Montana, South Dakota, Utah, Washington, Missouri and Iowa.

Pinch Seen in First Quarter

While DMPA was getting the machinery rolling to increase mineral and metal production, the National Production Authority was forecasting serious shortages in controlled materials to meet industrial production demands during the first quarter of 1952. NPA Administrator Fleischmann denied that his agency planned to institute a direct ban on the production of non-essential items, stating that such an action would be taken only as a last resort.

NPA released figures showing the allotments of controlled materials being made to industry during the first quarter, and these figures revealed that using industries were going to feel the pinch of tight metal supplies. The mining industry and the allied mining equipment manufacturing industry, however, received a fair share of materials for the first quarter.

To the Defense Minerals Administration for metal and nonmetallic mines, smelters, and refineries, NPA allotted 36,927 tons of steel, 1,605,000 pounds of copper, and 200,000 pounds of aluminum. The Defense Solid Fuels Administration for coke ovens will receive 17,258 tons of steel, 400,000 pounds of copper, and 70,000 pounds of aluminum. DSFA will also receive the following allotments for coal mines and plants: steel—9,096 tons, copper—213,000 pounds, and aluminum—15,000 pounds. The Mining Machinery Division of NPA was allotted 114,661 tons of steel, 283,000 pounds of copper, and 250,000 pounds of aluminum for the manufacture of mining machinery and equipment during the first quarter.

As further evidence of the growing metals and minerals pinch, the Defense Production Administration has revised its List of Basic Materials and Alternates which is used as a guide to industry and the Government in determining the availability of materials. The latest list classifies as "most critical" such materials as aluminum, lead, tin, zinc, copper, platinum, cobalt, columbium, molybdenum, nickel and tungsten.

Manpower Supply for Metal Mine Shrinking

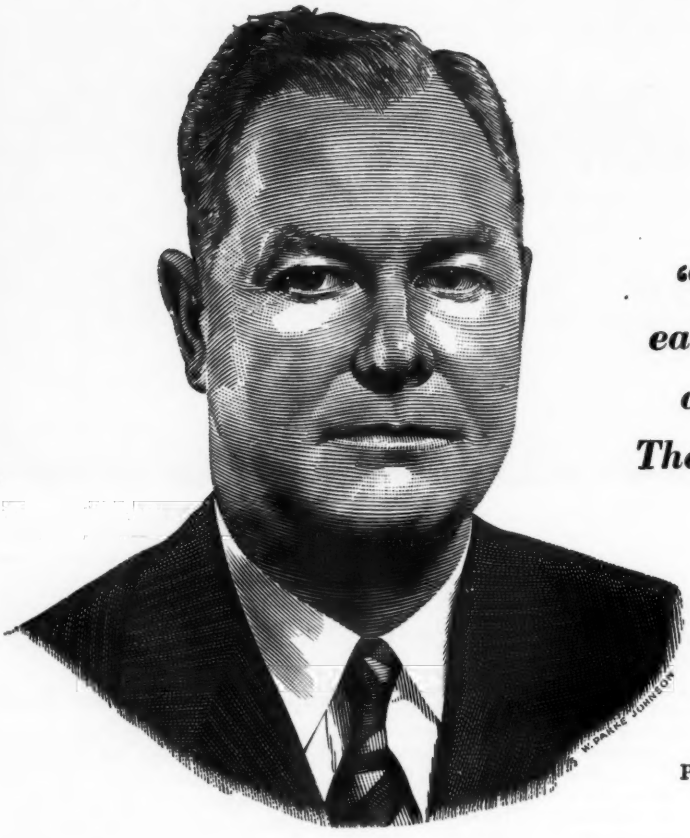
The Bureau of Labor Statistics has issued a report showing that the metal mining industry is finding it "increasingly difficult" to recruit the manpower it needs for expanded defense production. The Bureau reported that by 1955, the industry will need about 120,000 workers, almost 15 percent more than present employment. It said that "even though the manpower supply is expected to be generally adequate in the nation as a whole, shortages are likely to continue in this industry because of the limited labor supply in mining communities and because of sex and age restrictions on mining employment."

Elsewhere on the labor front, the Wage Stabilization Board has announced the settlement of the first labor dispute referred to it. The dispute, which involved the Garfield Smelter of the American Smelting and Refining Co. and the CIO United Steel Workers, was finally settled when the union and the company agreed to the establishment of a 3¼ cent wage differential between the 19 different labor grades in the plant. This is in addition to an 8-cents-an-hour across-the-board wage hike recently agreed to and approved by WSB.

Stockpile Metals Shifted to Industry

Because of a shortage of lead for industrial use, NPA has been authorized to distribute to defense and defense-supporting industries 6000 to 7000 tons of primary soft pig lead

(*Continued on page 72*)



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E. J. HANLEY

President, Allegheny Ludlum Steel Corporation

"Systematic Savings offer the surest means of future security and we know of no better systematic savings plan than that afforded by payroll deduction purchases of U. S. Defense Bonds. Nearly nine out of each ten of our employees are helping their country while they save by participating in this plan."

There are three easily understood reasons why 88% of Allegheny Ludlum's 14,378 employees are enrolled in the Payroll Savings Plan:

- the recognition by Mr. Hanley and his associates of the Payroll Savings Plan as a major contribution to America's Defense effort . . . an important, stabilizing factor in our national economy . . . a road to personal security for Allegheny Ludlum employees.

- Allegheny Ludlum's person-to-person canvass of employees, which put an application blank for the Payroll Savings Plan in the hands of every man and woman on the company payroll.

- the patriotism and sound sense of the Allegheny Ludlum employees who know that every dollar they invest *each month* in U. S. Defense Bonds is a double duty dollar—it helps to keep America strong . . . it builds personal security for the employee.

If employee participation in *your* Payroll Savings Plan is less than 50% . . . or if you are one of the relatively few industrial companies that does not have a Payroll Savings Plan, phone, wire or write *today* to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. You will get all the assistance you may need to place your company among the thousands of companies that have 60, 70, 80%, even 88% participation in the Plan That Protects.

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MINING CONGRESS JOURNAL

Wheels of GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

THE controversial situation in the House over the new Revenue Bill delayed the adjournment of Congress until October 20, when Senate and House members returned to their homes prepared to reconvene in Washington January 8, 1952. This first session of the 82nd Congress was marked by extremely heavy appropriations for defense and foreign aid, but showed a growing tendency on the part of the members of both Houses to exercise restraint and to withhold or to defer approval of many Administration legislative proposals. There was a noticeable reluctance to increase taxes in line with White House demand, the original $16.5 billion additional revenue request winding up with a bill estimated to yield $5.7 billion.

Revenue Act

Approved by the President at 2:07 p. m., October 20, the Revenue Act of 1951 came to the end of its rocky legislative road which began when the House Committee on Ways and Means opened hearings last February 5. The bill was passed by the House June 22, by the Senate September 28, and the final Senate-House Conferees Report was not approved until October 19.

Administration leaders at the Capitol were startled by a revolt on the House floor which resulted in the rejection of the first Conferees Report by a vote of 203 to 157. A defection in the majority party ranks, coupled with the absence of many members, precipitated this situation. The later vote on a second conference report sent the bill to the White House by 185 to 160.

During many days of uncertainty as to the final form in which the Revenue Act would be approved, a number of very important mining amendments were in jeopardy. These included the expensing of development and exploration costs, increase of coal depletion rate to ten percent, granting of percentage depletion to numerous nonmetallics, according capital gains treatment to income received from coal royalties, and the unit net income exemption from excess profits tax for potash, sulphur and chemical and metallurgical grade limestone mines.

As the bill became law the individual income tax increases 11 percent on the first $2000 surtax net income, with about 11¾ percent over the present tax liability in all other brackets, or nine percent of income after present taxes, whichever is less. This is effective November 1, 1951.

Normal corporate taxes from the present 25 percent to 30 percent, retroactive to April 1, 1951. On all income in excess of $25,000 the combined rate is 52 percent with a new corporate tax ceiling stipulating that for 1952 and later years no more than 18 percent of a company's excess profits income can be taken in excess profits taxes.

The excess profits tax base period income credit is cut back to 84 percent for all of 1951 income and to 83 percent for 1952 and later years.

The capital gains rate has increased from 25 percent to 26 percent, effective January 1, 1952.

In its Summary of the provisions of the Revenue Act of 1951 the Staff of the Joint Committee on Internal Revenue Taxation states: "Section 309 of the Bill provides that the taxpayer, with respect to expenditures made or incurred after December 31, 1951, in the development of a mine or other natural deposit may elect either to deduct development expenditures, whether incurred before or after the production stage had been reached, in the year when they are incurred, or to treat development expenditures incurred before the production stage has been reached as deferred expenses, to be deducted ratably as the ore or mineral is sold. Such an election may be made for each year, but must be for the total amount of net development expenditure made in that year with respect to the mine."

On expensing of exploration costs the Summary says: "Section 342 of the bill provides that with respect to expenditures made to ascertain the existence, location, extent, or quality of any deposit of ore or other mineral (other than oil and gas), prior to the development stage of a mine, the taxpayer (whether exploring for one or more mines) may elect to deduct in any taxable year any amount up to $75,000 paid or incurred in that year; or he may defer any amount up to $75,000 not deducted in the current year, and deduct that amount ratably as the minerals discovered or explored as the result of the expenditure are sold. Any taxpayer may treat such expenditures made in any four years, up to $75,000 per year, as deductible in either of these ways; after he has done this for four years, additional expenditures for exploration must be capitalized as under present law. Amounts so deducted will be a substitute for cost depletion based on such expenditures, but the allowances for depletion based upon a percentage of gross profit will not be affected.

"The amendment made by this Sec-

★ ★ ★ ★ ★ ★ ★

Washington Highlights

CONGRESS: Adjourned Oct. 20; reconvenes Jan. 8.

REVENUE BILL: Now law.

RENEGOTIATION: More agencies may act.

TARIFF: Suspension stymied.

PRICING: Capehart amendment survives.

FREIGHT RATES: Railroads would boost.

SCRAP: Nonferrous campaign on.

★ ★ ★ ★ ★ ★ ★

tion of the bill is to apply to taxable years ending after December 30, 1950."

Contract Renegotiation

Under Executive Order 10294 additional agencies of the Government are authorized to call for renegotiation of contracts under the Renegotiation Act of 1951. In the order, effective October 1, the Defense Materials Procurement Agency, Bureau of Mines, and the Geological Survey are so designated, "each of which exercises functions having a direct and immediate connection with the national defense." The 1951 Renegotiation Act gave renegotiation authority to the Department of Defense, Army, Navy, Air Force, Department of Commerce, General Services Administration, Atomic Energy Commission, Reconstruction Finance Corporation, Panama Canal, Housing and Home Financing Agency, and such other agencies of the Government exercising functions having a direct and immediate connection with the national defense, as the President shall designate.

Attention is directed, however, to the language in the Act which removes from renegotiation "any contract or subcontract for the product of a mine, oil or gas well, or other mineral or natural deposit, or timber, which has not been processed, refined or treated beyond the first form or stage suitable for industrial use."

Metals Duties Suspension

Held over to the next session of the Congress are the bills which would suspend the import duties on zinc, lead, tungsten and aluminum. The lead bill by Representative Mills of Arkansas and the zinc bill by Representative Doughton of North Carolina, following House passage and report to the Senate by the Finance Committee, were passed over on the Senate calendar on objection of Senator Malone of Nevada. The Senator charged that legislation of this type would "upset the entire economic situation of the United States of America." The tungsten bill remained in the Finance Committee after passage by the House and the aluminum measure is still in the House Committee on Ways and Means, following its introduction by Representative Celler of New York.

Both the lead and zinc bills provide that when, for any one calendar month, the average market price of metals for that month, in standard shapes and sizes has been below 18 cents per pound, the Tariff Commission, within 15 days after the conclusion of such calendar month, shall so advise the President, and the President shall, by proclamation, not later than 20 days after he has been so advised by the Tariff Commission revoke such suspension of the duties.

Price Control

The House Committee on Rules refused on October 16 to grant a rule for House floor consideration of the bill by Senator Maybank of South Carolina, which would have modified the Capehart (Rep., Ind.) price provision of the Defense Production Act. This Senate-approved measure would require the Office of Price Stabilization to consider post-Korea increases in cost of labor, material and transportation in establishing price ceilings, and would abolish the individual's right of appeal for higher ceilings, except in "hardship" cases.

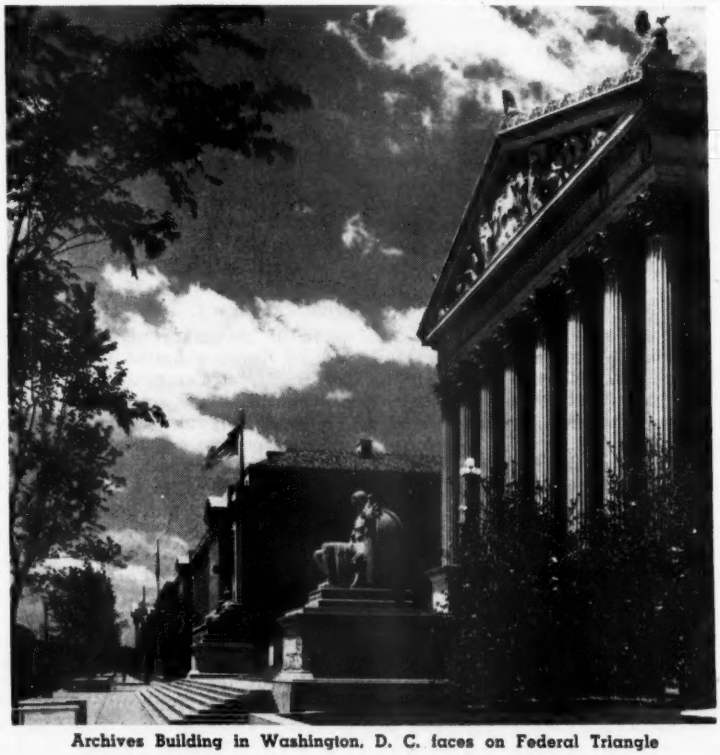
Under this bill OPS is required to consider these direct costs in setting price ceilings, but it is further provided that a "reasonable allowance" shall be included for "changes in all other necessary and unavoidable costs, including selling, advertising, office and all other production, distribution and administration costs." There is a limiting requirement, however, that the President must find that the added costs are "properly allocable" to production and sales of the materials or charges for the industrial services in question. The bill would have the effect of requiring manufacturers and others to absorb part of the higher cost incurred since June 30, 1950.

Freight Rates

Despite the too numerous industrial dislocations caused by higher freight rates, the railroads have now formally requested the Interstate Commerce Commission to reconsider its decision made in August and permit the full 15 percent increase requested last March. In its August action the ICC approved a temporary 9 percent increase in freight rates in the eastern territory and a 6 percent increase for the rest of the country. The railroads assert that operating costs have increased substantially and that their revenues have decreased. At the time the ICC acted in August the rate increases encountered opposition from Government agencies including OPS, General Services Administration, and others.

Nonferrous Scrap

Curtailment of production by a number of industrial enterprises, which depend on a continued supply of nonferrous scrap metals, has led to the formation of a Nonferrous Scrap Industry Mobilization Committee. Organization of the Committee was initiated at a meeting held under NPA Salvage Division officials in Washington October 11 and has been carried on through further meetings in New York. It is reported that new price schedules announced by OPS are stimulating the flow of the desired metals, but every effort should be made by those in charge of the operation of mining and associated enterprises to move these scrap metals into the normal trade channels immediately.



Archives Building in Washington, D. C. faces on Federal Triangle

AMC Personals

F. A. Fontyn, president, Coleman and Co., and Ebensburg Coal Co., was elected president of the Central Pennsylvania Coal Producers Association at the annual meeting of this Association and the Eastern Bituminous Coal Association. He succeeds **Heath S. Clarke**, chairman of the finance committee, Rochester and Pittsburgh Coal Co., who was elected vice-president of the Eastern Bituminous Coal Association.

Directors of Rico Argentine Mining Co. have named **James E. Hogle**, chairman of the board and a director of the Colorado mines firm. He had previously served as business manager and earlier as assistant general manager. He is also a member of the board of governors, New York Stock Exchange; president, Salt Lake Stock Exchange; and managing partner, J. A. Hogle & Co., brokers of Salt Lake City.

Dr. James Boyd has resigned as director of the U. S. Bureau of Mines and joined the executive staff of the Kennecott Copper Corp. His period of service with the Government began in 1941, when he was placed on active duty with the Army in the office of Robert B. Patterson, then Under-Secretary of War. In 1942 he was appointed to the Requirements Committee of the War Production Board. Later he became assistant to Gen. Lucius D. Clay, and when General Clay established his command in Europe, Dr. Boyd assumed the position of director of industry in the American zone of occupied Germany.

Upon his return to civilian life in 1946, Dr. Boyd accepted an appointment as Dean of Faculty at the Colorado School of Mines, relinquishing that post in 1947 to become assistant to the Secretary of the Interior. A few months later he was appointed director of the U. S. Bureau of Mines. In this position he guided the Bureau to new heights of service to the mining industry in the fields of technology, economics and safety.

With the increased emphasis on defense mobilization in 1950, Dr. Boyd was named head of the Defense Minerals Administration. While directing this agency he laid the groundwork for expansion of domestic mineral production. In mid-August, after President Truman created the Defense Materials Procurement Agency, Dr. Boyd left DMA to return to full-time duty with the Bureau of Mines. On October 1 his resignation was announced, effective October 16.

The Paul Weir Co. has announced its association with the Bestwood Company, Ltd. (U.K.) and H. H. Fraser and Associates (Pty.), Ltd. (S.A.), to form a consulting mining firm of Bestwood, Fraser & Weir, Ltd. **Robert C. Lancaster**, a vice-president of the Paul Weir Co., is chairman of the new firm and one of its directors. **Paul Weir**, president of Paul Weir Co., is also a director. The associated companies retain their identities and independent practices but will offer their collective services internationally.

Charles Rushton, mining engineer of Roslyn, Wash., has recently been selected to serve the unfulfilled term of the late Harry S. Boyle on the State of Washington Mining Board. The appointment of Rushton was announced in Olympia, Wash., by A. M. Johnson, director of the Department of Labor & Industries.

E. F. Maurer, president and general manager of the Rail & River Coal Co., has been appointed general manager in charge of the Powhatan Mining Co.'s deep mines along the Ohio River. The announcement was made by A. J. Ruffini, vice-president in charge of operations, North American Coal Corp.

Harold Vogt of Chicago has been named works manager of the U. S. Gypsum Co. plant at Heath, Mont., it has been announced by M. H. Basquin, production manager of the western gypsum division. Vogt will succeed **V. E. Coffman**, who has been transferred to the Genoa lime plant near Toledo, Ohio. Vogt was mine superintendent at Heath for a year before being sent to Chicago in 1948. Coffman started with the company in 1940 at Fort Dodge, Iowa, and was sent to Heath in 1941 as a quality superintendent. He was made works manager in 1944.

Edwin R. Keeler, chairman of the board of directors of Franklin County Coal Corp. in Southern Illinois has announced his resignation as an active officer of the company.

Keeler has spent his entire business career in the coal industry with Franklin County Coal Corp. and its predecessor, Taylor Coal Co. During that time he served successively as salesman, sales manager, vice-president, president and chairman of the board. During the past year he has been president of Southern Illinois Coals, Inc. and a director of the Illinois Coal Operators Association.

Roy H. Glover was elected a member of the board of directors, vice-president and general counsel of the Anaconda Copper Mining Co. at a recent meeting of the board.

At the same time it was announced that **Clark S. Judd** resigned as a member of the board.

Glover, as vice-president and general counsel, takes a position last held by W. H. Hoover, now president of the company.

David E. Morgan, mining consultant, is currently visiting coal, lignite, and metal mines in Europe, North Africa and the Middle East. Morgan has been active in the engineering of coal preparation plants for the governments of Italy and Greece.

Robert M. Lloyd has been elected vice-president, Raw Materials Division of U. S. Steel Co. M. W. Reed, executive vice-president, Engineering and Raw Materials, has announced.

After graduating from the University of Pittsburgh with a B.S. degree in electrical engineering, Lloyd completed several years work in metallurgy at Carnegie Institute of Technology. He first joined U. S. Steel as an employe in the sales department of the Carnegie-Illinois Steel Corp. in 1926.

Lloyd was transferred to the Raw Materials Department in 1933 and later became assistant director of that department. He was appointed assistant to the vice-president of the former U. S. Steel Corp. of Delaware in December, 1945, and assistant vice-president of U. S. Steel Co. on January 1, 1951.

The recently elected new officers of the American Retail Coal Association are: **P. M. Nauman**, president; **Robert Bidlack**, first vice-president; **B. E. Youngquist**, second vice-president; **G. E. Mithe**, treasurer; and **A. Wm. Honecker**, secretary. **B. E. Urheim** continues as executive secretary of the Association.

D. I. Hayes, western manager of American Zinc, Lead and Smelting Co., has announced the following organization changes, which became effective October 1, 1951:

H. F. Mills, former general superintendent of Grandview Mine at Metaline Falls, Wash., was promoted to the position of western geologist.

John W. Currie who was mine superintendent is now general superintendent of the Grandview operation.

Claude L. Sage has been promoted to the position of mine superintendent from general mine foreman.

Otis Hagberg, former night mine foreman replaces Sage as general mine foreman.

Armstrong R. Matthews became president of the Pocahontas Fuel Co., Inc., November 1. Matthews, president of Clinchfield Coal Corp. before accepting the position with Pocahontas Fuel, succeeds **Hugh R. Hawthorne**, who became chairman of the board of directors and will continue to serve as chairman of the executive committee.

Directors of East Standard Mining Co. have elected the following new officers: **H. J. Hintze**, president; **A. J. Elgrren**, vice-president; and **Fred Finlinson**, treasurer.

Dr. Robert T. Gallagher, a member of the faculty at Lehigh University since 1942, has been named head of the department of mining engineering, president Martin D. Whitaker announced recently. He fills the vacancy created by the death of Professor A. Copeland Callen in July.

A native of Johnstown, Pa., Professor Gallagher is the author of numerous articles for mining magazines. He has done research work in the development of geophysics in the control of mining operations, mine roof detectors, and metal preparation.

It has been announced that **C. E. McManus**, assistant to the general manager of Minnesota Mines for **M. A. Hanna Co.**, has been appointed manager of mines, Iron Ore Co. of Canada, the operating company in the Labrador ore fields in which Hanna holds an interest. He will be in charge of all mining operations there.

At the same time **B. M. Andreas**, superintendent of the Cooley district, was named general superintendent of Hanna's Mesaba operations. **R. C. Wallace**, who has been assistant superintendent at the Mississippi group, replaces Andreas as superintendent of the Cooley district.

Ayrshire Collieries Corp. of Indianapolis, Ind., has announced the promotion of **Roy E. Dean** to the position of assistant to the president. He succeeds **G. Don Sullivan**, who resigned to join the staff of National Coal Association in Washington, D. C.

Dean, following discharge from the Army, joined the Ayrshire organization in 1946.

William P. Woodside, one-time vice-president of the Climax Molybdenum Co., was recently honored by the American Society for Metals. A bronze plaque, saluting him as the founder of ASM, was dedicated at the National Metal Exposition, held in Detroit. Woodside is chairman of the board of Parks Chemical Co., Detroit, Mich.

Frank Lilly, a leading Spokane mining figure, has been asked to serve as statistician and technical adviser for a new gold committee appointed by the International Monetary Fund. The committee was formed to study the world's gold-price situation.

CORRECTION

Mining Congress Journal wishes to apologize for the error on page 85 of the October issue in which Paul Hett was listed as vice-president of the Nevada Mines Division of Kennecott Copper Corp. Mr. Hett is Assistant General Manager of Nevada Mines Division.

Harrison Brewer, associate editor of the Casper, Wyo., Tribune-Herald, has been named executive assistant in the office of Robert R. Rose, Jr., assistant secretary of the Interior for mineral resources. Rose is a former mayor of Casper.

Sam S. Coldren has accepted the position of mine superintendent for the Blythe Manganese Co., Blythe, Calif.

Darashaw Nowersherwan Wadia, geological advisor to the Atomic Energy Commission of the Government of India, recently visited this country to consult with officials of the U. S. Geological Survey and the Bureau of Mines. While here, he also visited the geology departments of leading American universities, research institutions, oil fields, mines and minerals processing plants.

—*Obituaries*—

An automobile accident claimed the lives of Mr. and Mrs. **A. H. McIntire, Sr.**, in mid-September. Mr. McIntire, 65, was secretary-treasurer of the New River Co., Mt. Hope, W. Va., a position he had held since 1918. He joined the coal mining firm in 1910 and had been with them longer than any other official.

C. L. Best, pioneer inventor and tractor builder, died recently at San Francisco, Calif., at the age of 73. One of the founders of Caterpillar Tractor Co., he was chairman of the board and member of the executive committee at the time of his death.

Chester C. Cook, president and chairman of the board of the Sunday Creek Coal Co., died recently at his home in Columbus, Ohio. Born in 1881, Mr. Cook was a director of Buckeye Coal and Railway Co. and a member of the American Coal Sales Association, and Ohio Coal Operators Association, in addition to his affiliation with Sunday Creek.

John P. Roberts, 43, assistant general manager of The Timken Roller Bearing Co., Service Sales Division, was killed in an automobile accident near Spruce Pine, N. C. September 19.

Mr. Roberts, who started with Timken in September 1935, began his career in the Pittsburgh warehouse of the company and progressed through the organization to salesman in the Pittsburgh district, branch manager in the Minneapolis territory, and in 1945 was named assistant general manager of the Service Sales Division.

Edward Griffiths, 68, President of the Glen Alden Coal Co., died suddenly October 25 at his home near Wilkes Barre, Pa.

During his 50 years in coal mining, Mr. Griffiths advanced from laborer to president of his company. His long career included service to the industry on the Anthracite Operators' Wage Negotiating Committee, of which he was chairman; the Pennsylvania Anthracite Emergency Committee, and active participation in the American Mining Congress, Coal Division.

Adolph Bregman, former managing editor of the *Metal Industry*, died recently at the age of 61 after a brief illness.

Mr. Bregman was associated at various times during his life with the Wanakah Mining Co., Columbia Smelting and Refining Co., Nichols Copper Co., and the Anthony Co. Since 1938 he had been a consultant in electrochemistry.

Charles W. Morse, formerly superintendent of the zinc concentrator of the Anaconda Reduction department of the Anaconda Copper Mining Co., died recently at Dover, N. H. He retired several years ago. He started at the Anaconda plant in 1915.

Consol Wins Award

In the final ratings of the independent board of judges in the Financial World Survey of Annual Reports, Pittsburgh Consolidation Coal Co. was judged as having the best annual report of the coal and coke industry. The bronze "Oscar of Industry" was presented to George H. Love, president of the company, at a banquet in New York, on October 29, 1951.

Reveal Uranium Source

International Minerals and Chemical Corp. has announced that it expects to recover uranium as a by-product at a large phosphate chemical plant it has under construction at Bonnie, Fla.

Louis Ware, president of the company, made the announcement and predicted that the plant would be completed late in 1952 or early in 1953. It will produce mineral phosphates and multiple super-phosphates as primary products.

Allocate Coal Exports

In a move to increase the flow of U. S. coal to meet stepped-up defense production requirements overseas, the United States has established allocation and licensing on exports of bituminous and anthracite coal to all countries except Canada.

The programming and coordination of U. S. coal exports was made necessary to assure that essential needs of other friendly nations are met, despite inadequate vessel supply and congested port facilities brought about by extremely heavy demands for U. S. coal at this time. Exports of U. S. coal are currently running at the rate of 3,300,000 tons per month.

The purpose of the program is to effect maximum utilization of Hampton Roads (Va.) facilities and equitable distribution among importing countries of the coal moving through that port. Severe congestion of port facilities and inefficient use of vessels at Hampton Roads has resulted from concentration of foreign demands on coal shipments through there.

Diesels Barred Underground

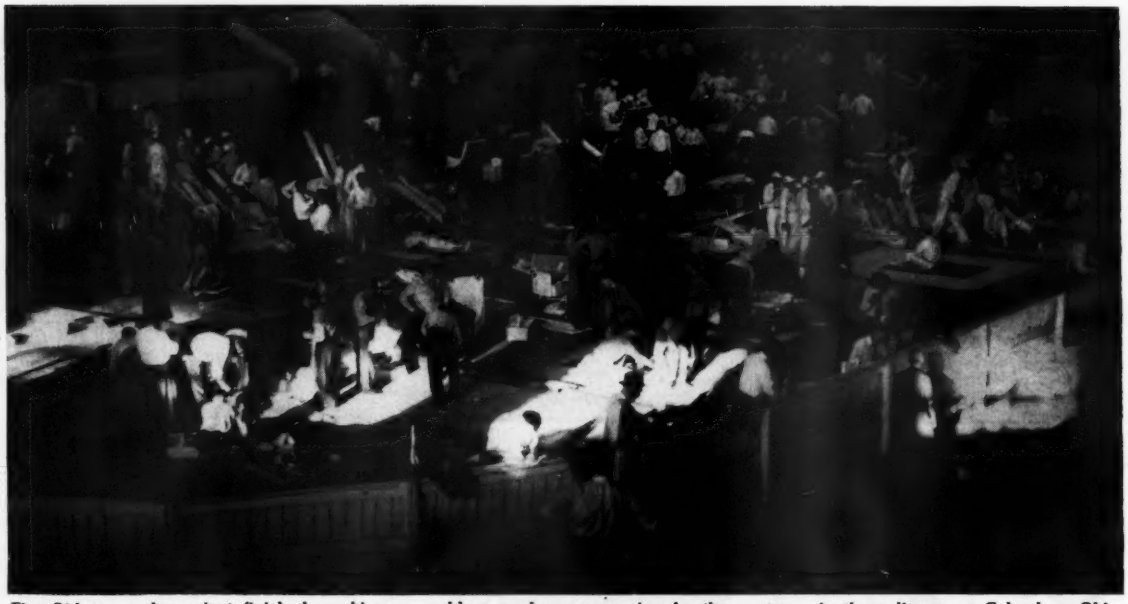
A recent ruling by the Attorney General of West Virginia at Charleston, W. Va. holds that the state mining law prohibits the use of diesel locomotives underground in coal mines.

According to the Attorney General's statement, the intent of the legislature at the time the law was passed was the paramount consideration in his decision, not safety or non-safety in the use of diesel locomotives.

Find More Zinc Ore

Howard I. Young, president of American Zinc, Lead and Smelting Co., reported recently that the size of the ore body in Jefferson County, Tennessee, originally discovered in 1950 "is much greater than anticipated." Young told stockholders that development work will be pushed in order to bring these ores into production within the next eighteen months to two years.

Washington representatives of 11 trade associations participating in the Iron and Steel Scrap Salvage Program met with officials of the Office of Public Information, National Production Authority, Wednesday, September 19, to discuss the formation of a new Trade Association Information Committee on Scrap. Purpose of the committee is to advise on ways NPA promotional information services can be made more useful and to devise methods of obtaining more active participation of trade associations in the promotion of greater heavy, industrial scrap collection. The American Mining Congress represented by A. W. Dickinson (standing fourth from left) pledged full support to NPA's drive to "get out the scrap."



First-Aid teams have just finished working a problem, and are preparing for the next one in the coliseum at Columbus, Ohio

National First-Aid and Mine-Rescue Contest Held at Columbus

FIFTY-FIVE first-aid teams, 15 mine-rescue teams, and one combination team, competed for honors in the 13th National First-Aid and Mine-Rescue Contest, held at Columbus, Ohio, October 2, 3, and 4. Over 600 men, from all over the country, were entered in what has been termed the "greatest safety show on earth," and gave concrete evidence why the mining industry has improved its safety record through the years.

Winner of the Mine-Rescue contest, held Tuesday, October 2, was the team representing UMW, District 16, Kitzmiller, Md., with a total of only 90 discounts. The First-Aid competition was won by the Philadelphia and Reading Coal and Iron Co.'s team from Pottsville, Pa., with a score of 99.68. A team from Dun Glen No. 11 Mine of the Hanna Coal Co. Division of Pittsburgh Consolidation Coal Co., Dun Glen, Ohio, won the Combination First-Aid and Mine-Rescue award.

That each attending team was well qualified to be at a meet of such great scope is evident in the closeness

Illustrations through the courtesy of Bituminous Coal Institute.

Combination First-Aid and Mine-Rescue team winners from Dun Glen No. 11 Mine, Hanna Coal Co., Dun Glen, Ohio. (Left to right, front row) Louis Jesalosky (Capt.), Charles Penuska. (Standing) Joe Vargo, Jr., Russell Shores, Zack Chusages, John Stock and Dewey Piccin

Winning First-Aid team, Philadelphia and Reading Coal and Iron Co., Pottsville, Pa. Shown with the Congressional Medallion and trophies are: (left to right, front row) George Moss (Capt.), H. A. Wheat, Anthony Yanowsky. (Back row) Francis Whalen, W. A. Baker, Joseph Gayuski, and Joseph McCall

of contest scores. The first-place team in first-aid had a score of 99.68 as compared to the last-place team with a score of 96.56. Things were just as close in mine-rescue competition, where the winning team had 90 discounts and the last, or 15th place team, had only 150 discounts.

The contest literally started with a bang Tuesday evening as the spectators were given a demonstration of the explosibility of coal dust just before the Mine-Rescue contest was held. Contestants and observers were welcomed by Lt. Gov. George Nye of Ohio on Wednesday, following which part of the First-Aid contest was held. On Thursday noon, Frank J. Lausche, Governor of Ohio, addressed those in attendance at the final day's competition.

Awards were made at the banquet held in the Neil House, Thursday evening, with Mr. E. H. Davis, president of the New York Coal Co. as toastmaster. After individual state champions were announced, the trophies and awards were presented to the top three teams in each division. Second-place honors in the First-Aid contest were taken by Republic Steel Corp.'s Indianola Mine team, Indianola, Pa. Third place went to the team from Mine 214, Jenkins, Ky., of the Consolidation Coal Co. (Ky.).

United States Steel Corp.'s team from Robena Mine, Uniontown, Pa., took second place in the Mine-Rescue contest with 104 discounts. The third-place Mine-Rescue team was from Consolidation Coal Co.'s (Ky.) Clover Splint Mine, Clover Splint, Ky., with 109 discounts.

Films of the entire contest were taken to be used in civil defense training. The mining industry's trained safety teams are a valuable resource should a national emergency in which they are needed ever arise.

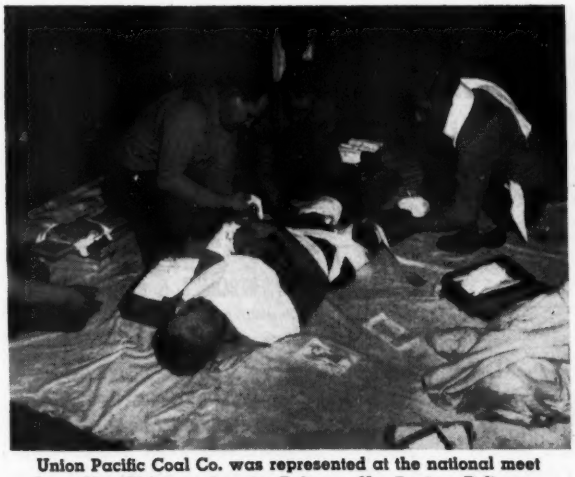
Although the contest was open to teams from the entire mining industry, only coal was represented. Next year every effort will be bent toward encouraging participation by teams from every segment of the mining industry.

This was the 13th national safety contest since the first one in Pittsburgh, Pa., 40 years ago and the first in the past 20 years. It should not be this long until the next one as enthusiasm was high and the most common comment was "just wait until next year."

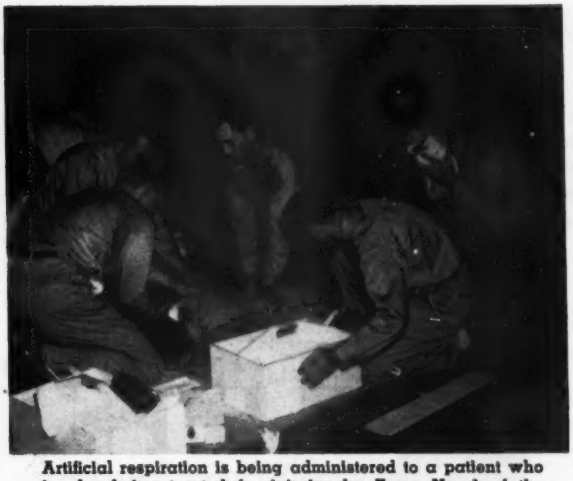
The winning Mine-Rescue team, UMWA, District 16, Kitzmiller, Md., is shown here with James Boyd, former director, U. S. Bureau of Mines and John Owens, secretary-treasurer, UMWA. Reading left to right (top row) are Boyd, Carl A. Schell (Capt.), Owens. (Second row) Richard Sherwood, Mervin Sims. (Bottom row) Carl Paugh, Lee Hartman, and Chester Evans

Among interested spectators were wives of Central West Virginia Coal Mining Institute's First-Aid team members, shown here with Governor Frank Lausche of Ohio

UMWA, District 16, team members check their equipment just before going on the field to win top honors in the Mine-Rescue competition



Union Pacific Coal Co. was represented at the national meet by a First-Aid team from its Reliance No. 7 mine, Reliance, Wyo.



Artificial respiration is being administered to a patient who is also being treated for injuries by Team No. 1 of the Black Star Coal Corp., Alva, Ky.

Take Combination Locomotives for Example

In a combination trolley-battery locomotive, the battery is charged directly from the mine d-c power supply so that charge rates are not critically controlled. Edison Nickel-Iron-Alkaline Storage Batteries meet this condition consistently. In fact, they can safely be charged at full normal rate at any state of charge and, for short periods of time, at even higher rates. Nor do they require equalizing charges. When used in straight battery locomotives, they usually can be charged in six to seven hours; this helps get the charging done during off-peak hours.

However, their non-critical charge characteristics are only one of their advantages. They are *durable mechanically:* grids, containers and other structural parts of the cells are of steel. The alkaline electrolyte is a recognized preservative of steel. They are *foolproof electrically:* they are not injured by short-circuiting, reverse-charging or similar accidents. They *withstand temperature extremes:* they are not injured by freezing at any state of charge because the density of the electrolyte does not vary appreciably with the state of charge; they are easily ventilated for rapid cooling. They can *stand idle indefinitely* without injury: they are merely discharged, short-circuited, and stored in a clean, dry place.

These characteristics add up to trouble-free operation, unequaled long life and economy per year of operation. The combination of these factors helps explain the preference of cost-conscious users. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. Thomas A. Edison of Canada, Limited, Montreal.

Wanted

Electrical Renewal Parts Salesman with electrical engineering background or equivalent training in service shop work and 5-10-years sales experience. Prefer a man familiar with coal and metal mining who is between 30 and 40 years old. Knowledge of business organization very valuable as this man will act as coordinator of an aggressive sales program. This is a select position for the right person; good starting salary and excellent opportunity for advancement. Write Box 225 in care of this publication, stating qualifications and references.

Government Wants Engineers

The United States Civil Service Commission has announced a new examination for filling positions in all branches of engineering. The salaries range from $3100 to $10,000 a year. The positions are located in Washington, D. C., and vicinity. Sanitary engineer positions in the U. S. Public Health Service located throughout the country will also be filled.

Full information and application forms may be secured at most first- and second-class post offices, from Civil Service regional offices, or direct from the United States Civil Service Commission in Washington, D. C. Applications will be accepted in the Commission's central office in Washington, D. C., until further notice.

MUSHROOM MINERS—Deep in an abandoned limestone mine in western Pennsylvania, these girls help harvest a mushroom crop. Because mushrooms grow best in absolute darkness, the pickers and others of the 200 employes at the underground farm wear standard miners' cap lamps, the only illumination in the mine. This mushroom mine is one of the country's largest. About half of the crop goes to nearby plant for use in mushroom soup.

Coal Miners to Meet

On December 13 and 14 the Coal Mining Institute of America will hold its sixty-fifth annual meeting at the William Penn Hotel in Pittsburgh, Pa. One of the highlights of the meeting will be the annual dinner on Thursday night, December 13, when Mr. Harry M. Moses, president, Bituminous Coal Operators' Association, Washington, D. C., will be guest speaker.

Propose Mining Institute

A vocational technical mining institute for the express purpose of training prospective or present employes in the mining industry has been proposed for Pennsylvania. A bill is now before the State legislature to appropriate $1,000,000 for the purchase of land and erection of buildings to house such an institute.

Discover Zinc Mine

East Sullivan mines has discovered a zinc deposit in the Gaspe Peninsula of Quebec, Canada. They have already done considerable exploration, and plans to develop the property are underway.

Quebec Premier Maurice Duplessis revealed the discovery in a recent news conference.

Marvel No. 3 Closes

The Roden Coal Co. closed its Marvel No. 3 mine in September after nearly 50 years of continuous operation. The mine was in the Clark Seam at Marvel, Ala. It is reported that unprofitable operations forced the closing of the mine which employed approximately 150 men. Last year the company produced about 135,000 tons of coal. At one time its daily output was about 1800 tons.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for October 1, 1951.

City of Washington,
District of Columbia, ss:

Before me, a notary public in and for the state and county aforesaid, personally appeared Bertha C. Wilkerson, who, having been duly sworn according to law, deposes and says that she is the business manager of THE MINING CONGRESS JOURNAL, and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in Section 537, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor and business manager are:
Name of publisher, The American Mining Congress, Washington, D. C.
Editor, John Cameron Fox, Washington, D. C.
Business manager, B. C. Wilkerson, Washington, D. C.

2. That the owners are: The American Mining Congress—a corporation, not for profit. No stockholders. President, Howard I. Young, St. Louis, Mo.: Secretary, Julian D. Conover, Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

BERTHA C. WILKERSON,
Business Manager.

Sworn to and subscribed before me this 19th day of October, 1951.

KATHRYN A. HATHAWAY,
Notary Public.
(My commission expires July 31, 1952.)

Electrical Mine Cables

(Continued from page 24)

be electrically heated to 275° F for both jacket and insulation, together with reeling stands for the cable.

Small cuts in the jacket can be cleaned with low boiling point gasoline, cemented, and cured with a heated clamp or mold.

Deeper cuts or permanent damage to jacket should be buffed smooth, using a motor driven abrasive wheel, and the jacket replaced, using neoprene tapes applied over the cemented surface. These repairs should be cured in the molds provided for the purpose.

Splices Should Be Flexible

All temporary repairs should be cut out and remade. Care must be taken to provide a flexible conductor splice; splicing sleeves or soldered connections are generally not flexible enough for mine use. The ideal method is to unlay the individual bunches of strands and to silver braze each such strand to its opposite. In doing this, about six in. of strand is unlayed. The two central strands are cut off at the end of the unlayed section and brazed. Then the strand on one end of the splice is unlayed two in. further, and the strand from the other end laid in the place it occupied. Both strands are cut off to butt when in place and brazed together. The next strands is unlayed four in. and the process repeated, unlaying the next strand six in. The same procedure is repeated on the other side of the splice until each strand is brazed to its opposite over about 12 in. of conductor. If there are 19 groups of strands in the conductor, the distance between brazes can be cut down proportionately.

An acetylene torch with needle point flame tip is very convenient for making the brazes.

A simpler way of making the splice is to unlay the strands for two in. on each side of the splice and force the two ends together. The overlapping strands are then tucked into spaces between the strands on the unlayed conductor as in making a rope splice. The whole is served tightly with copper wire which is secured by twisting the ends together.

The next step is to pencil (i.e. chamfer) the insulation on each side of the splice, smooth the penciling with sand paper or a rasp and coat with rubber cement. The splicing rubber is then wrapped on tightly and evenly. The splice on the conductors should be cured in a mold before the conductors are laid together and the jacket taped on.

It is important to pencil the original jacket on either side of the splice and coat with cement to get a good bond between splice and jacket.

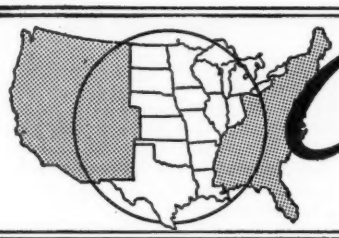
Vulcanize at 275° F

While vulcanization can best be effected in a mold a little larger than the original cable, a satisfactory cure can be obtained by covering the surface of cable and splice with cotton tape or varnished cambric and immersing in melted paraffin maintained at 275° F. The time of cure will depend on the materials used and will vary from 15 to 75 minutes.

The important thing is to have the splices made in a clean location by men experienced in handling splices, and under conditions where the work is not rushed.

A regular repair and inspection program will prevent many cable failures in service, as well as permit the use of much cable that would otherwise be scrapped. A little experience with the cost of shop repair will indicate how short a length of cable it is economical to save by splicing into a longer piece. The program will save the operator money and provide work for men who, temporarily, cannot do their regular work.

We are confronted today with rising costs and material shortages. The conditions are ideal to initiate a cable saving program that will surely result in lower production costs.



Central States

Construct Taconite Plant for Operation in Late 1955

Several years of study on the utilization of taconite have resulted in the letting of a contract for the construction of the first large plant to produce a blast furnace feed from the taconite of Minnesota in commercial tonnage. The Reserve Mining Co. has announced the plans for construction of a 2,500,000-ton per year beneficiating plant for producing high-grade iron ore from magnetic taconite.

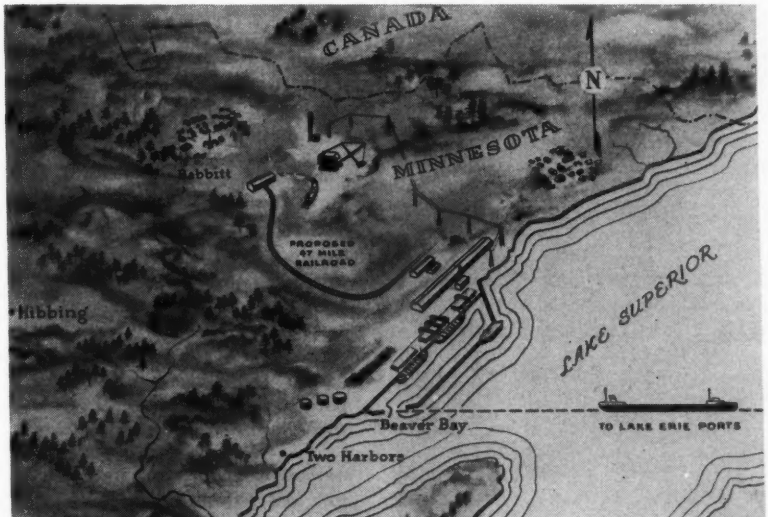
Present plans call for completion of the construction in 1955 with the first operation either late in that year or in early 1956. The new plant will be located on the north shore of Lake Superior about 55 miles east of Duluth, Minn. at Beaver Bay, Minn. It will be connected by a 47-mile railroad with Reserve's mining property at Babbitt, Minn., on the extreme eastern end of the Mesaba Range. A contract for the construction of the railroad has also been let.

Provision will be made in this construction program to enlarge the plant as required to a 10,000,000 ton-per-year plant. Power plant capacity and heavy foundation work are included in the current construction project to accommodate at least part of this additional capacity.

To operate the 2,500,000 ton plant at full production, the mining of 7,500,000 tons of taconite will be necessary. This ore will go through a crushing plant located near the pit, which is being opened up at Babbitt, before shipment to Beaver Bay.

Work is proceeding at the present time toward the re-equipping of a 300,000 ton-per-year one section plant at Babbitt which will be in operation early next year. The Babbitt plant will permit the beneficiating process to be completely studied and developed to perfection while construction of the larger plant is under way. The larger plant will be designed in multiples of the process being developed in Babbitt. Eight such sections will be included in the first phase of the construction with 32 sections contemplated for the eventual 10,000,000-ton plant.

Partners in Reserve Mining Co. are Republic Steel Corp. of Cleveland, Armco Steel Corp. of Middletown, Ohio and National Steel Corp. of Pittsburgh. Manager of Reserve Mining Co. is Oglebay-Norton & Co.



Principal features of the $75,000,000 production project are: A 47 mile railroad from Babbitt to Beaver Bay, a 2,500,000 ton-per-year concentrating plant at Beaver Bay, a harbor and loading facilities, power generating and transmitting equipment, and the construction of two towns to house the thousands of men who will be employed.

Build Fluorspar Mine

Ozark-Mahoning Mining Co., Tulsa, Okla., is entering into an agreement with Defense Minerals Procurement Agency for the expansion of fluorspar production. The agreement calls for Ozark to develop a fluorspar mine and build a milling plant. In turn, the Government guarantees Ozark a floor price on the output of the new operation and that it will buy any of the output that cannot be sold in other markets for the floor price.

The company expects to have its new facilities in production in mid-1952. The agreement will be terminated at the end of five years or after the Government purchases 100,000 tons of the concentrate, whichever is first.

Choose Bargaining Agent

National Labor Relations Board has ordered an election to determine the bargaining agent for employes of the Knife River Coal Mining Co. at Beulah, N. D. Richard P. Link, an employe, filed a petition asserting that the Progressive Mine Workers of America is no longer the bargaining agent for the employes. Company and union officials contended that they had a contract which bars Link's petition. The Progressive Mine Workers, at a hearing before the NLRB, contended Link represented the United Mine Workers and asked for dismissal of his petition. The NLRB ruled it had found no evidence to support the proposal for dismissal of the petition and ordered an election to decide whether the Progressive Mine Workers should continue as bargaining agent.

Kaiser Adds New Ore Sources

Kaiser Aluminum and Chemical Corp. has announced it will develop additional aluminum ore sources on the island of Jamaica and adapt its Baton Rouge, La. plant to process the ore. The Jamaica properties may supplement present aluminum ore sources by nearly 1,000,000 tons a year. The company has purchased or taken option on 11,000 acres on the Caribbean island.

Facilities to be built will include a railway, processing buildings, and a deep-water dock. First shipments of of ore will probably be made in about a year. It was also announced that the pouring of the first primary aluminum metal will be made in November at the new reduction plant being constructed in New Orleans. The plant and power facilities will have a capacity of 200,000,000 lb of metal a year.

Cars for Winter Ore Movement

A substantial increase in the flow of iron ore from the Mesaba Range in Minnesota to mills in the Pittsburgh district will be virtually assured when the Bessemer and Lake Erie Railroad puts the first of 500 new 70-ton ore cars into service early next year.

These new cars with a special type door facilitate the unloading of ore, limestone and other heavy commodities. They were especially adapted for this main-line, long-haul service by redesigning the standard ore car used in short-route service and adding special construction features. The cars are also equipped with steam holes in the sides so that frozen materials may be defrosted quickly and efficiently. This will expedite the handling of heavy commodities during the winter months.

The ore-thawing operation, which actually takes place on the Union Railroad, after movement over the Bessemer and Lake Erie, is unique. Seventy cars of frozen ore are moved in cuts of 35 cars each on parallel tracks. Steam jets are inserted through holes in the sides of each car and live steam is forced into the frozen ore. On the average, 70 cars were being thawed every three hours, over a 24-hour period, last winter and spring. The steam is generated by steam locomotives stationed at each end of the tracks.

Copper Mine Worked Out

First opened in March 1931, the Sherritt Gordon Gold Mine at Sherridon, Manitoba, Canada, has made its last shipment of copper concentrate. With the ore body exhausted, the mine is being dismantled and much of the equipment moved 150 miles north to the company's new nickel mine at Lynn Lake.

Lignite Lab Dedicated

Secretary of the Interior Oscar L. Chapman officially dedicated the Charles R. Robertson Lignite Research Laboratory of the U. S. Bureau of Mines at Grand Forks, N. D., September 29. The lignite laboratory and the gasification pilot plant were then opened to the public for inspection.

Completed last December, the installation was designed to solve problems arising from the development of large domestic reserves of recoverable lignite—estimated at 355,725,000,000 tons.

Plan Cobalt Mill

National Lead Co. is to begin immediate construction of a treatment plant to recover cobalt metal from ore concentrates at its Fredericktown, Mo. properties. To be ready for production in 14 to 18 months, the plant will process 50 tons of concentrates per day.

The company's present mining and milling operations in that area are producing sufficient ore concentrates to sustain continuous operation of the new treatment plant.

Development of a new metallurgical process has made the recovery of cobalt, now in extremely short demand, commercially feasible at the new plant.

Steel Plant Piling Driven

The job of driving more than 68 miles of piling, upon which will rest Lone Star Steel Co.'s new mill, has been completed at the East Texas works north of Longview, Tex., according to E. B. Germany, Lone Star president. Almost 7000 piles were driven, some to a depth of 60 ft, Carl Kreutziger, project manager, revealed. He also reported that the excellent weather of the past summer

had enabled the job to maintain a schedule which promises steel and steel pipe before the end of 1952.

Lone Star's progress report indicates the stockyards are about one-third completed. The high line is nearing the 50 percent mark, and the slag pits are about 40 percent finished. In the open hearth building proper, concrete work for the furnace foundations, flues and stacks is in progress. The refractory material was on hand when contractors began installation of this material toward the end of September. Railroad connections to the open hearth are complete.

Minnesota Ore Discovery

A deposit of non-ferrous ore in the Kawishiwi River area, 12 miles south of Ely, Minn., has been tested by geologists and mining men. First assay reports have indicated that the ore contains copper and nickel, with small amounts of cobalt, gold and silver. Preliminary surveys show the area to be at least five miles long, with an undetermined width. Drilling operations on the deposit have been undertaken by a group of Duluth and Ely businessmen.

American Zinc Expands

Messrs. Hubert E. Howard and J. H. Buchanan, principal owners of the Nellie B Mining Co., have announced the sale of this company to the American Zinc, Lead and Smelting Co. Properties of the Nellie B consist of approximately 1360 acres in the heart of the Oklahoma section of the tri-state lead and zinc district. Three concentrating plants are presently treating 3000-4000 tons of zinc-lead ores per day. Transfer of ownership became effective midnight, September 30.

The Nellie B Mining Co. is the second largest producer of zinc-lead concentrates in the tri-state district, and the new owners expect to continue the operations at maximum capacity with the present staff.

To Purchase Mica

A mica purchase depot will be set up at Custer, S. D., by the Defense Minerals Procurement Agency, it was recently announced. The Black Hills is a major source of mica, essential in electronics, and establishment of the depot is expected to stimulate production.

Fayal Mine Closes

One of Minnesota's oldest underground mines was shut down in September, because its ore supply was exhausted. The Fayal Mine of the Oliver Iron Mining Co. was opened in 1897 as part of the Fayal Mining Co. Oliver took it over in 1902. W. J. Kaiser, general superintendent for Oliver's eastern Minnesota district, said that the more than 40 men working at this mine would be transferred to the nearby Spruce underground mine immediately. Fayal mine produced more than 33,000,000 tons of ore during its life.

Complete Gasification Test

About 10,210,000 cu ft of potential industrial gas were produced from lignite during the 18th experimental run recently completed in the U. S. Bureau of Mines pilot plant at Grand Forks, N. D., it was announced recently by Paul Zinner, Regional Director, Region V.

The test run, longest to date, was voluntarily shut down after 947 hr of successful operation. Conducted under the supervision of Walter H. Oppelt, chief of the Bureau's Region V Utilization Section, the run used 438,415 lb of lignite donated by six mining companies in North Dakota and Saskatchewan, Canada.

Nearly 85,000,000 cu ft of gas have been produced during the 18 test runs since the pilot plant began operating in 1945.

The gas may provide a way toward greater use of the Nation's 355,725,000,000 tons of recoverable lignite reserves. It could be used in producing synthetic liquid fuels, reducing Minnesota iron ore, manufacturing ammonia fertilizer for agricultural use, and for the hydrogenation of vegetable oils and fats.

To produce water gas, lignite is fed into the top of an 18-ft, chromium-nickel alloy, circular retort, heat applied and steam introduced with more lignite.

Map New Ore Fields

Discovery in northern Minnesota of seven extensive belts of high magnetic attraction which may indicate iron-bearing rock formations was disclosed recently by the United States Geological Survey and the Minnesota Geological survey.

Announcement of the find was made along with the public release of seven additional maps based on the aeromagnetic survey of approximately 45,000 sq miles in the northern half of the state, underway since 1947 as a joint project of the federal agency and the Minnesota survey.

Maps released cover all of Lake of the Woods County and parts of Koochiching, Beltrami, Roseau and Clearwater Counties—an area of about 6000 sq miles. Previously released maps of the aerial survey included some 25,000 sq miles and indicated potential iron formations in Itasca, St. Louis, Cass, Hubbard, Becker, Otter Tail, Morrison and Aitkin Counties. Mining companies are now exploring several of these indicated formations in a search for commercial iron ore.

The seven new maps outlining these promising areas were placed on public display at the office of the Minnesota Geological survey, Minneapolis; at the office of the United States Bureau of Mines, Duluth; and at the office of the Division of Lands and Minerals, Hibbing.

At the present time, the aerial prospectors are directing their search for new Minnesota iron deposits to the northwest corner of the state where they will record the magnetic pattern in a 6900-sq-mile area including all of Marshall, Pennington and Kittson Counties and part of Roseau, Red Lake and Polk Counties.

Pillar Extraction With Roof Bolts

(*Continued from page 33*)

ported from other districts. The dependable, audible warning of impending failure generally is the same as when roof bolts are not used.

It is perhaps of interest to note the condition of some of the bolts around the fringe of caved areas following falls. In some instances, bolts are broken within the threaded length; within the slotted sections, or between the threaded end and the slot of the bolts.

Under no circumstances is full pillar extraction with roof bolts recommended without use of sufficient breaker and turn timbers—also, the method should not be attempted without sufficient preliminary experimentation and advice.

Summary

Thus far, it appears that the open-end lift pillar system is more successful when extracting pillars with roof bolts; however, there are conditions, where the pocket-and-fender method, or a modification, may be desirable. In any case, complete extraction is necessary.

Pillaring with conventional roof supports in the mines investigated generally did not permit complete extraction of the coal and resulted in delayed caving, broken roof over the active areas adjacent to the line of extraction, and irregularity in the breaklines. In some instances the practice was to leave small isolated stumps of coal purposely as supplemental roof support. These blocks along with a large number of posts tended to cause a cantilevering beam action over a comparatively larger area by flexure and gradual subsidence. This delayed reaction usually caused excessive stresses to be set up within the abutment area of the blocks being mined, affecting the roof outby or over the immediate working area.

Pillar extraction with roof bolts and breaker posts has an opposite effect. The number of posts required with roof bolts lessens the tendency to set up conditions which cause undue delay in caving of the roof. Consequently, the roof breaks progressively over comparatively small mined-out areas and does not cantilever excessively. This decreases or minimizes the abutment load and prevents it from extending over the solid pillar producing premature roof flexure.

In all five mines studied the results obtained by roof bolting in pillar extraction indicate that definite advantages are gained in safety, efficiency and conservation.

These five mines produced over 2,000,000 tons of coal from pillars without a fatal accident and with but four lost-time accidents as compared with two fatal and 71 nonfatal accidents during a similar period when conventional mining methods were used. A production increase which ranged from .86 to 10.7 tons per man-shift, easily absorbed the general increase in cost of roof support, and the average overall recovery was raised from 76.3 to 87.31 percent.

Acknowledgment

The data contained herein represent the experience of the operating companies who voluntarily supplied them for the benefit of the industry. This cooperation is gratefully acknowledged. The role of the authors was that of occasional consultants. The very helpful cooperation of members of the West Virginia Department of Mines is also gratefully acknowledged.

Problem in Shaft Sinking

(*Continued from page 29*)

are required for mucking. At the present shaft depth, an average round of 60 buckets is mucked in about 10 hr.

Two 40-hp electric pumps, each with a capacity of 225 gpm under a 400-ft head, are normally available for pumping water that collects in the shaft bottom. Before blasting, these pumps are hoisted up out of the way.

Water was pumped directly to the surface initially. As the shaft was deepened, permanent pumps were installed in the 418-ft pumping station. The sinking pumps now deliver water to a reservoir at this station. Additional temporary pump substations with 40-hp units are installed at intermediate levels to reduce the head on the sinking pumps.

Concreting and Shaft Support

Concrete is placed as soon as required for support. At two places it was considered advisable to pour less than one set. Where ground permits, six sets (42 ft) are concreted in one pour.

It takes the crew 48 hr to prepare for concreting a 42-ft vertical section. The concrete lining is ordinarily placed 18 in. to 2 ft from the shaft bottom.

First, six steel sets are hung on 7-ft centers by assembling them one at a time on the shaft bottom, hoisting them, and bolting them in place.

One bearing set is placed at each level. It is anchored three ft into the shaft walls by means of hitches cut in the rock.

Reinforcing steel, consisting of ⅞-in. diam rods tied together to form 18-in. squares, is placed three in. outside the sets. In extremely fractured ground, rods are spaced to form 6-in squares, and additional reinforcing is placed 15 in. from the steel sets.

Any leaks in the rock walls of the shaft are boxed, and pipes are placed to drain the water to the inside of the shaft. Originally grout was injected through these pipes to seal the leaks after the concreting was completed. However, grouting through these pipes was discontinued after the shaft was down 500 ft because the open weep holes prevent high water pressure from developing behind the concrete lining.

A bracket or bearer to support the two permanent 20-in. pump lines is also installed before concreting. It is placed in hitches cut into the rock and concreted later. These bearers are placed at 42-ft intervals down the shaft and are not connected to the steel sets.

Wooden concrete forms are placed next. The flooring is attached to the bottom set and inclines downward at 30° toward the shaft walls. Fourteen pour boxes are placed on top of the flooring. The open ducts formed by these pour boxes and the slope of the flooring, later permit a tight joint to be made at the top of the next 42-ft section of concrete.

Forms for the sides of the concrete lining are made of 2-in. planks placed vertically between the outside H-beams of the sets. To hold them in place, they are blocked and wedged against the inner sides of the outer flanges. The steel sets are thus set into the concrete by the thickness of an H-beam flange. Side forms are installed, one vertical 7-ft section at a time, as the concrete is poured.

During the actual concreting procedure, "Ready-Mix" concrete (1:2.5:-3.5) is delivered to the shaft collar by two mixer trucks from a batching plant nearby. Aggregate consists of limestone crushed to ½-¾ in. To each bag of cement, 0.4 lb of pozzolith is added to waterproof the concrete and make it easier to pour. The correct amount of water to be added is determined by slump tests before each pour. Accurate and complete records are kept of the slump tests and compression tests on samples taken at the shaft collar and from the forms. The desired minimum compression strength is 3000 psi after 28 days. All pours have exceeded this.

At the shaft collar, the mixer truck pours the concrete into a 6-in. steel pipe, which extends down the shaft to a "header" resting on a solid timber support just above the section to be concreted. An "elephant-trunk" spout is attached to the header, and the concrete is placed in the forms. Constant telephone communication is maintained between the shaft bottom and the surface during a pour.

The practicality of dropping concrete vertically down a pipe several hundred feet deep was questioned at the outset. It was believed that the concrete would segregate and the header would erode rapidly. Such is not the case. The concrete flows out of the header slowly enough to be caught by hand, and accurate tests show there is no segregation.

Vibrators are used to pack the concrete tightly and eliminate voids. It takes about two hr to place a section of concrete lining 7 ft high. The concrete is allowed to set for eight hours, and then another section is placed. The top seven ft is poured through the ducts in the concrete above, left by the pour boxes of the previous 42-ft section.

General data on shaft sinking and labor and material requirements to July 1, 1951, are summarized in the accompanying tables. The shaft was 835 ft deep at this time.

Wyoming Coal to Be Tested

Mining of 4000 tons of coal from the Lake Desmet area near Sheridan, Wyo., for testing in the U. S. Bureau of Mines' liquid fuels plant at Louisiana, Mo., began in September. The coal will be tested to determine the feasibility of locating a synthetic liquid fuel plant close to Sheridan. The vast coal reserves contained in the 22 ft seam in this area would provide a source of supply for such a plant, according to those who conceived the idea.

Exploration at New Almaden

Exploratory operations have begun at the New Almaden quicksilver mines near San Jose, Calif., leased recently by Cordero Mining Co. Part of the old workings are being reopened and preparations made for extensive diamond drilling of areas believed to contain mercury deposits. Comprising 4500 acres on Capitancellos Ridge and in adjoining areas, New Almaden mines were formerly worked to a maximum depth of 2400 ft through a series of shafts and long tunnels. Mine Hill, highest point on the property, is 7000 ft above sea level and forms one of the 12 mines constituting the New Almaden group. Miles of underground workings extend from Cora Blanca to Guadalupe mines, but the numerous shafts, tunnels and drifts caved in long ago and are no longer accessible.

Placer Project Underway

A gold placer project has been started in Sumpter Valley, Baker County, Oreg. The deposit of Tertiary gravel is being prepared for hydraulic mining. An old ditch has been reconditioned and pipe, flumes, boxes, and tailings dams installed and several miles of roads built. The first test run is slated for the Spring of 1952.

Mica Processed Without Water

The mill of the Great Western Mining Co. near Mora, N. M., is processing mica without the use of any water. The plant was designed by Rufus Little of Santa Fe because of the lack of an adequate water supply.

Ore is first crushed and then screened to separate the flat, flaky mica. Little says his mill is now shipping about a carload a week, only 20 per cent of the mill's capacity. Full production will be achieved when a power shovel is received to speed loading at the mine. The milled mica is shipped to processing plants at Ft. Worth, Texas.

Plan Manganese Depots

The U. S. Government plans two depots to buy about 300,000 tons of manganese from Montana small mine operators, according to the Montana state resources development board. Depots are to be set up at Butte and Philipsburg. Plans were completed at a meeting attended by Board Chairman Lester Loble and two General Services Administration officials from Seattle.

Manganese will be purchased in lots of five tons or more. The Butte depot will take ore containing 15 percent or more manganese carbonate and ore above 12 percent will be bought at Philipsburg.

Heavy Metals Studied

Research work in the processing of Idaho's "heavy metals," such as columbium, selling for $127 per pound and tantalum, $70 per pound, is now under way at the University of Idaho's chemical and engineering department. Ore used in the study will come from pegmatite dikes in the Garden Valley district of Boise County, Idaho.

Uranium Developed

Edward Bottomley and Gus Rogers are developing uranium ore on four claims, 18 miles from Lovelock, Nev. The vein has been opened to a depth of 12 ft and exposed by a short drift below the outcrop on a ridge. The ore contains gummite, a hydrous uranium sulphate.

California Asbestos

Diamond drill testing of the Stark asbestos property, northeast of Nevada City, Calif., is scheduled by Phillip Carey Co. of Cincinnati. Dr. R. J. Merrill, company geologist, reported the U. S. Government has authorized a loan of more than $16,000 for exploration.

Preliminary investigation indicates an extensive deposit, and large scale operations are contemplated if the drilling program proves satisfactory. The Stark was worked profitably during World War I, but has been idle since. Phillip Carey Co. became interested in the mine during its search for dependable sources of commercial grade asbestos in the west.

Blackbird Ships Concentrate

The Calera Mining Co. (subsidiary of Howe Sound) has started operating its new cobalt concentrating mill on a tuneup basis, stockpiling the cobalt concentrate, pending completion of a cobalt refinery in Utah. The mill, which will have a 1000-ton daily capacity, is currently shipping a by-product of copper concentrate. Blackbird mine is located near Salmon, Idaho, and is the only producing cobalt mine in the United States.

Development Contract Let

Gibbons and Reed Co., Inc. of Salt Lake City has been awarded a contract by the Climax Molybdenum Co. for over 20,000 ft of development work at the company's mine at Climax, Colo. The contract, which extends until January 1, 1953, calls for development of the Storke level 300 ft below the Phillipson level, which is the main operating tunnel into the Climax mine.

In the picture on the left, Frank A. Barrett, Governor of Wyoming, addresses the crowd attending the award banquet. I. N. Bayless, president of Union Pacific Coal Co., is seated at his right, and Tom A. Burke, National Safety Council on his left. The photograph on the right shows Theodore Marvin, director, "The Explosives Engineer" (left) congratulating H. C. Livingston, vice-president in charge of operations, Union Pacific Coal Co.

Reliance No. 7 Wins Safety Trophy Again

FOR the twelfth time in 18 years of enrollment in the National Safety Competition, mines of the Union Pacific Coal Co. have won the Sentinels of Safety trophy. The 1950 competition was won by the employes of Reliance No. 7 mine at Reliance, Wyo., winners in 1948 and 1949 also. Their winning record was 449,090 man-hr without a lost-time accident. This is but part of the three-year total of 1,219,728 man-hr without a lost-time accident, an achievement which has continued through 1951 to date.

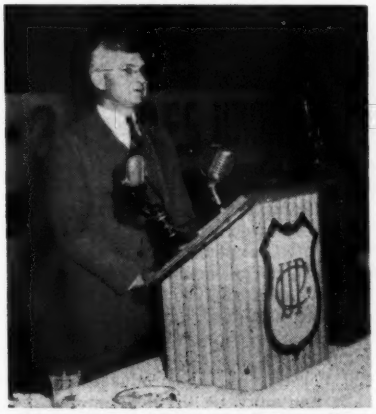
Reliance No. 7 refutes the age-old belief that coal mining cannot be safe, and illustrates the fact that safety education pays off. This should be a challenge to the nation to equal this achievement by teaching and practicing safety in the home, in the schools, and on the highway.

The presentation ceremony began in great style with a parade through Rock Springs, Wyo., led by the company's well-known Kiltie Band. After the march, a dinner was served to the miners and guests with H. C. Livingston, vice-president in charge of operations of the Union Pacific Coal Co., as toastmaster.

Among those who saluted the three-time winners was the Governor of Wyoming, Frank A. Barrett; I. N. Bayless, president of the Union Pacific Coal Co.; A. J. Seitz, executive vice-president of the Union Pacific Railroad; Robert R. Rose, assistant secretary for mineral resources, Department of the Interior; J. H. East, Jr., regional director of the U. S. Bureau of Mines at Denver; and H. E. Shumway, general manager of the Union Pacific Railroad.

Theodore Marvin, director of the *Explosives Engineer* magazine, presented the trophy to Mr. Livingston, who called on general manager V. O. Murray to present the individual Certificates of Achievement in Safety to Lawrence Welsh, mine superintendent. Terry Martin, fire boss at Reliance No. 7, accepted the trophy, the safety flag, and the certificates for the men.

Lawrence Welsh, mine superintendent, received the individual Certificates of Achievement in Safety for his men



Terry Martin, fire boss at Reliance No. 7, accepted the trophy, safety flag, and certificates for the men

The pre-banquet parade was led by Union Pacific Coal Co.'s well-known Kiltie Band and a Color Guard (Boy Scouts)

Market Found for Waste

The Bunker Hill Smelter at Kellogg, Idaho, has found a market for smelter slag and has contracted to ship 70,000 tons of the smelter's waste material to the Lehigh Portland Cement Co. at Metaline Falls, Wash. The cement plant, one of the largest in the northwest, uses 40 tons of slag daily in its cement mixture.

Domestic Quartz Find

General Service Administration has announced the first strike of a domestic source of quartz measuring up to stockpile specifications for quartz crystals used in frequency control for radio and electronic equipment. It said the deposits are located on the Goshute Indian reservation in northern Utah. Entire output will be purchased by GSA for stockpiling.

To Open Fluorspar Mine

H. W. Gould Co. of San Francisco is completing preparations for construction of a fluorspar processing plant in the Gabbs region of Nevada. The plant will concentrate 250 tons of fluorspar daily from the Baxter property in the Broken Hills district, 35 miles from Fallon, Nev. Developed by five shafts and extensive lateral workings, the Baxter has been explored along the vein for more than 3750 ft and to a depth of 500 ft.

Mine Access Road Approved

Washington State has approved construction of a two-mile mine-to-market road at the Advance Mine at Northport, Wash. Expenditures for the construction work will come from the state's special mine-to-market road fund.

Daly-West Operating

After many years of idleness the Daly-West mine, two miles south of Basin, Mont., is again in operation. The mine, owned by Paul George of Basin, is under lease and bond to James Gill and Geo. Freyler of Basin, Dr. A. Naegeli of St. Paul, and Dr. L. C. Naegeli of Livingston, Mont. The tunnel is now in 165 ft. A drift extends 50 ft into the silver-lead-zinc ore body on the tunnel level. The operators expect to drive a 50-ft raise to the surface, install a hoist, and then sink in the ore.

With the Defense Agencies

(*Continued from page 53*)

which would have been delivered to the national stockpile during the last quarter of 1951. The agency has made similar allocations to consumers with respect to zinc. To date some 55,000 tons of copper have been withdrawn from the stockpile to meet industrial mobilization needs.

Early in October, NPA also announced that aluminum will likewise be diverted from the stockpile to industry for the last quarter of this year and that this policy may have to be followed during the first quarter of 1952.

Zinc-Lead Prices Boosted

Effective October 2, the Office of Price Stabilization increased the ceiling prices for imported and domestic lead and zinc metals, ores and concentrates by 2 cents a pound. Lead was raised to 19 cents a pound on the basis of delivery at New York, and zinc was increased to 19½ cents a pound East St. Louis.

Later in the month, OPS raised the price ceilings on products in which lead and zinc are important raw materials to reflect the 2 cents increase made in the two metals. Lead and zinc chemicals were likewise included in this latter price adjustment.

At the month's end, NPA placed imported pig lead under allocation in order to permit all consumers to share in this source of supply.

Coal MRO Order Issued

Effective October 23, solid fuels producers were permitted to use an allotment symbol H-8 to obtain limited quantities of controlled materials and the rating DO-H-8 to obtain non-controlled materials for maintenance, repair and operating supplies (MRO) and for minor capital additions. This long-awaited order, NPA Order M-87, is similar to that now in effect in other branches of the mining industry. The order affects coal mines, coal preparation and processing plants, merchant and integrated coke plants, and coal chemical and petroleum coke calcining facilities.

Solid Fuels Administrator Charles W. Connor stated that a producer using the procedure set forth in the Order M-87 must establish a quarterly quota based, in general, on the rate of his expenditures for MRO in a base period consisting of the last nine months (April through December) of the calendar year 1950. In calculating the MRO quota base, a producer multiplies by twelve the monthly average of all MRO expenditures in the standard base period consisting of the last nine months of 1950. Under the order, the standard quarterly quota is 30 percent of the quota base. A seasonal quota for all four quarters is 120 percent of the producer's quota base and may be divided among the four quarters in accordance with the seasonal requirements of the producer.

Lengthen Dauntless Tunnel

Leadville Lead Corp., Leadville, Colo., plans to extend its Dauntless tunnel an additional 500 ft. A contract has been awarded to Beals-Van Cooten, Alma, Colo. Previously the tunnel had been driven 1000 ft to get under old workings.

If sufficient ore is indicated, the bore will be extended to within seven miles of the Leadville smelter. Ore from the company's property now must be trucked 84 miles to the smelter. The 500-ft addition is expected to cut southern extensions of the Lynn and Stewart vein systems. Another 700 ft, the next phase, should put the heading under the Hilltop and Last Chance workings.

Output Up At Rico

Production from the mill and lead-zinc-silver property of Rico Argentine Mining Co. has increased from 100 to 140 tons of concentrates per day according to Sherman B. Hincklay, president and general manager. From 90 to 100 miners, mill hands and others are employed at the Rico, Colo., property. The company has under construction ten new five-room houses for supervisory employes and 12 cement block homes for Navajo Indian employes of the mine.

Abandonment of the Colorado & Southern Railroad Co.'s narrow-gauge line to Rico, will necessitate haulage of concentrates to smelter by truck.

Silver-Copper Ore Proved

Silver Summit Mining Co., Wallace, Ida., drifting west on the vein on the 3000-ft level, has proven an extension of silver-copper ore for an additional 270 ft. Prior to this time the vein showed a commercial sized ore shoot 850 ft in length.

Manufacturers Forum

Light Conveyor Introduced

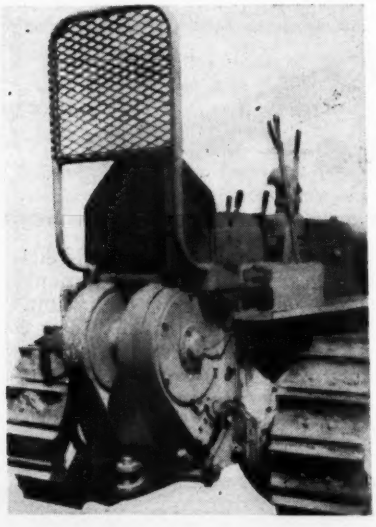
Baughman Manufacturing Co., Inc. has introduced a new model portable conveyor. Model No. 272 is a light-duty, portable contour, troughing conveyor, built for easy maneuverability.

Using 10-in. three-ply rubber belt, it is built in lengths of 16 to 28 ft. According to the makers, its light weight makes it possible for one man to maneuver, and the narrow axle facilitates movement through doorways.

Complete information will be sent upon request. Address the company at Jerseyville, Ill.

HySpeed Winch Announced

Designed to supply increasing demand for a lightweight, free-spooling tractor winch with fast line speeds and quick positive brake action, a completely new D4 HySpeed Winch has been developed by the Hyster Co. and is available for immediate delivery.



The new winch can be applied as a production, maintenance, and general utility tool. A few of the jobs it will perform are lifting, pulling, crane work, light pile driving, ground skidding logs, bundling pulp logs, and "feeder cat" work in logging.

Specification sheet for the new D4 HySpeed Winch are available from the Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore.

Enter Mining Field

Mackintosh-Hemphill Co., a veteran manufacturer of rolls and machinery for the iron and steel industry has entered a new field of manufacture and is currently marketing a line of forged steel disposable bits throughout the mining industries.

Col. James S. Ervin, president of Mackintosh-Hemphill, Pittsburgh, announced recently the formation of the company's Drill Bit and Tool Division. This new division is charged with the research, development and manufacture of a line of disposable bits. These bits are being manufactured in a new building adjacent to the company's Midland Plant at Midland, Pa.

According to Col. Ervin, the new bits are manufactured and distributed under a license agreement. Drill Bit and Tool Co. will sell the new product, the "DBT Throwaway" bit, throughout the United States and South America.

Materials Handling Box

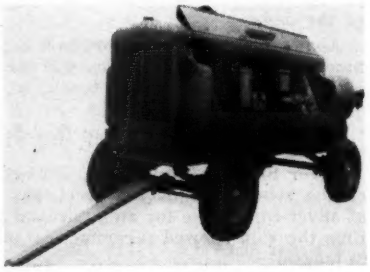
A collapsible materials handling box which can be dumped by a lift truck with revolving apron is the latest development of Phillips Mine & Mill Supply Co. Capable of being collapsed or erected in less than 20 seconds, this "Phil-Box" is equipped with reinforced guide holes on all four sides for entry by the prongs of a fork lift truck.

Having a capacity of 5000 lb, it is completely self-contained without loose pins or parts. It folds down to a collapsed height of less than 10 in., permitting small storage space.

For additional information on the Model B-50-F Phil-Box, white to Phillips Mine & Mill Supply Co., 2394 Jane St., Pittsburgh 3, Pa.

New Compressor Available

Strip mine and quarry operators now have available for their use the New Standard Model 365 air compressor, manufactured by the Jaeger Machine Co., Columbus, Ohio, and featuring Diesel power by Cummins. The



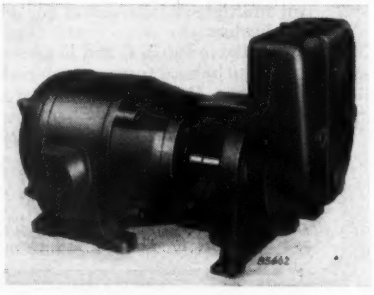
new compressor is rated at 365 cfm at 100 psi.

Both the Cummins diesel and Jaeger compressor are mounted on structurally welded main frames. The heavy duty wagon has an "auto-steer" front axle, and can be hauled safely at 35 mph over rough roads, according to the manufacturers. Steel wheels or skid mountings are also available.

Length of the complete rubber tired unit is 12 ft, 3 in.; width, 5 ft, 10½ in.; height, 6 ft, 9 in.; and weight, 8500 lb.

Self-Priming Motorpump

Ingersoll-Rand Co. has introduced a new line of self-priming motorpumps. These are intended for applications under suction lift where the presence of air or vapor makes it impractical to use the conventional centrifugal type. The pumps are used in process and bulk station applications,



for mine drainage, bilge pumping and sump draining.

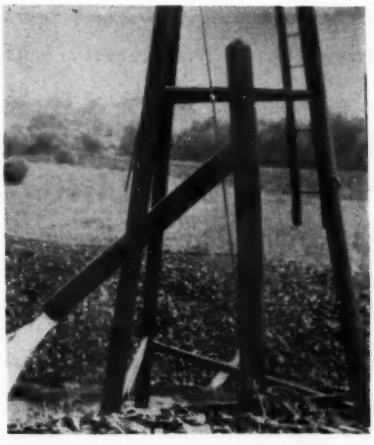
Conventional centrifugal pumps, operating under suction lift, completely lose prime when appreciable volumes of air or vapor are present. To reestablish prime, it becomes necessary to fill the suction line and casing before starting. According to the manufacturers, their new pump overcomes this disadvantage by recirculating liquid trapped in the casing. During normal pump operation there are no recirculation losses and thus no need of valves to cut off recirculation. No flap valve is used because the pump casing is so proportioned that sufficient liquid is trapped on shut down to insure priming when the unit is re-started.

The pump is built in sizes from ¼ to 25 horsepower, with capacities up to 800 gpm and a head up to 180 ft.

Additional information may be obtained by writing Ingersoll-Rand Co., Dept. CAM, 11 Broadway, New York 4, N. Y. Request Bulletin 7240.

Handle Acid Mine Water

Carlon Products Corp. has reported that 180 ft of 8-in. Carlon rigid pipe was installed in a new bore hole at the Wilkes-Barre, Pa. mine of the Lehigh Valley Coal Co. This pipe is being used to transmit mine water from a pump to the surface at the rate of 800 gpm under 80 psi static head. While metallic pipe lasted only a



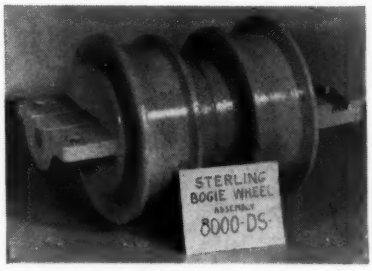
short time in this type of bore hole installation, Carlon is expected to give many years of service, according to the manufacturer.

The 21-ft sections of pipe were connected quickly by means of cemented slip sleeve fittings, and the entire installation of 180 ft of plastic pipe in the bore hole was completed in only five hr. The illustration depicts the all plastic discharge spout designed to eject the water a distance from the bore hole.

Information can be obtained from the Pipe Division of the company, 10225 Meech Ave., Cleveland 5, Ohio.

New Bogie Wheel Marketed

Sterling Steel Casting Co. is ready to market the Sterling Bogie Wheel Unit after three years of work and design. The units are fully Timken bearing equipped and are completely



assembled, adjusted, and lubricated before leaving the plant. According to the manufacturers, they do not have to be lubricated until after 1500 hours of continuous operation and are easily dismantled and repaired. More information can be had from this company at P. O. Box 230, East St. Louis, Ill.

Buy Conveyor Rights

Joy Manufacturing Co. has concluded an agreement with Bituminous Coal Research, Inc., covering the exclusive rights to certain features of a flexible steel shaker conveyor.

The conveyor is equipped with an extensible stainless steel belt, which is wound on a spool and feeds out to a length of around 300 ft. It was developed primarily for use with continuous mining machines.

—*Announcements*—

Alex J. Night, well-known **Allis-Chalmers** hoist engineer, is retiring after being associated with the company for over 42 years.

Night joined Allis-Chalmers in January, 1909, and has been continuously associated with its processing machinery departments. He is credited with various patents which have been assigned to Allis-Chalmers and has authored hoisting articles for technical publications.

National Mine Service Co. has appointed **Joseph F. McMahon** as assistant treasurer in the Whiteman Division of the company at Indiana, Pa., according to an announcement by Gordon MacVean, president.

Atlas Powder Co. recently announced the appointment of **James A. Gilruth** as manager of its advertising and sales promotion division.

Gardner Harvey, who has been acting manager of Atlas advertising and public relations division, was granted a leave of absence November 30.

The **Marshall Equipment Co.** of Huntington, W. Va., has been appointed the representative of **Sterling Steel Casting Co.**, East St. Louis, Ill., in West Virginia and Eastern Kentucky.

R. E. Ferry has recently been appointed manager of apparatus sales offices in Wheeling and Fairmont, W. Va., for **Westinghouse Electric Corp.** J. E. Payne, Central District manager of apparatus sales, announced the appointment in Wheeling. Ferry will be located in the National Bank of West Virginia Building, Wheeling, and will supervise apparatus sales activities for Westinghouse in the Wheeling and Fairmont districts.

A major expansion of engine production capacity, involving new facilities to cost $6,000,000 was announced by Irvin Miller, president of **Cummins Engine Co., Inc.**, Columbus, Ind., following recent approval by the board of directors. This third major expansion program within the past nine months will increase production capacity at Cummins at least 50 percent over the 1950 record high level.

CATALOGS AND BULLETINS

ENGINEERING STANDARDS FOR MULTIPLE V-BELT DRIVES. *The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, N. Y.* The manual indicates the proper sheaves and belts to be used for the attainment of optimum efficiency and economy of the complete drive in relation to the particular duty required. Data is based on the latest engineering opinion and research.

Standards may be obtained at a cost of $1.00 for two copies from either the Multiple V-Belt Drive Association, 7 West Madison St., Chicago 2, Ill., or The Rubber Manufacturers Association, Inc.

HOSE FITTINGS & LINE OILERS, *Worthington Pump & Machinery Corp., Dunellen, N. J.* Bulletin H-1200-B44 contains sizes, parts numbers and applications of Blue Brute Hose Fittings.

Specification Sheet H-1200-B45, pictures and describes the Blue Brute 2 Qt. Line Oiler, giving detailed specifications.

These bulletins may be obtained by writing the company.

PINIONS AND GEARS. *General Electric, Schenectady 5, N. Y.* This 8-page bulletin describes the wide assortment of G. E. gears and pinions available for industrial haulage equipment. It also shows G. E.'s manufacturing and testing facilities and provides a complete nation-wide list of gear sales outlets and apparatus service shops.

WOOD PRESERVATIVE. *J. H. Baxter & Co., 200 Bush St., San Francisco 4, Calif.* This descriptive 12-page illustrated booklet traces the history of the development of chemonite wood preservative, a copper-arsenate compound, and gives facts and figures to show its efficiency.

Index to Advertisers

a *practical* answer to the manpower shortage

Here's one way to keep most of your miners on ore production—and still carry on an effective development program.

One man — equipped with the Gardner-Denver S48 Sinker-FL2 Feed Leg combination — can drill impressive footages in development drifts and crosscuts. You'll find the one-man crew practical on other assignments, too, such as working remote stopes, secondary breaking at draw points, eye-bolt drilling, etc.

This lightweight Gardner-Denver combination is specially designed for fast drilling with tungsten-carbide tipped rods and detachable bits. It consists of the new 45-pound S48 Sinker—the equal of most 55-pound drills in speed and power—mounted on the lightweight, long-travel FL2 Air Feed Leg.

Write us today for complete information.

for more footage per man-hour
... always choose
GARDNER-DENVER SINKERS

Heavy-duty shaft-sinking models also available.

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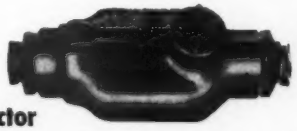

from the drill doctor

Drills lubricated by the L012 Automatic Line Oiler *can't* run dry—never show symptoms of inadequate lubrication.

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